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THE

NATURE AND TREATMENT

OF

RABIES OR HYDROPHOBIA.

BEING THE

REPORT

OF

THE SPECIAL COMMISSION APPOINTED BY

THE MEDICAL PRESS AND CIRCULAR,

WITH VALUABLE ADDITIONS.

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PREFACE.

An apology is scarcely necessary at the present time for a treatise on a disease which, during the past year, has created such alarm in Great Britain. For a considerable period the columns of the leading journals throughout the country have overflowed with correspondence on the subject of hydrophobia, some devoting special articles to the prevalence of the malady and its prevention. The numerous deaths that occurred in various parts of England during the year necessarily tended to heighten the interest and excitement. Though the majority of the communications published were characterised by a general acquaintance with the disease, still a large number of the letters afforded ample evidence that there was much wide-spread ignorance, both as to the nature of the affection and the remedies for it—Curative, Preservative, and Preventive.

Under such circumstances the motives which induced *The Medical Press and Circular* to publish this special

report were very simple, and may briefly be summed up:

1st. A desire to advance scientific inquiry as to the nature of rabies or hydrophobia.

2nd. To present the profession and the public with the latest state of our knowledge on the subject.

As a commission on rabies or hydrophobia without a member of the veterinary profession to assist would be like playing "Hamlet" with the part of Hamlet omitted —for the subjects are so interwoven with the animal world that it is difficult to separate them—we arranged that one of the most distinguished veterinarians of the age should contribute the chapters on preventive measures and on the affection in animals.

Readers of the report will learn how much the profession is indebted to Mr. Fleming, and we need not say a word further in praise of the work he has done to clear up the pathology of this sad affection.

It is with much regret we have had to differ from such an honoured and learned member of our profession as Sir Thomas Watson, but in the interest of truth and science, no other course was open. Even though we had no substantiated cases of recovery, we consider a more hopeful tone in reference to curative treatment would be justifiable. During the past year so many conjectures have become certainties, so much that was deemed impossible possible, so much progress has been made in

the scientific world, that he would be indeed bold who would put a limit to the conquests of science.

The practical use of electricity seemed almost to have been perfected when the world was astonished by the invention of the telephone by Professor Bell. The liquefaction of oxygen or hydrogen was deemed impossible, but that has now been accomplished. Medicine and science are so inseparably connected, that with such encouragement, the word "despair" should be erased from our vocabulary. Having certified cases of recovery, we may reasonably look forward to still further triumphs over the ravages of this disease, and we have no doubt that rabies will be controlled with as much certainty, as dilatation of the pupil is controlled by belladonna or atropine, or contraction produced by calabar bean or its alkaloid eserine.

The materials we have collected cannot fail to be useful to other workers in this field. This report has, so far, answered its purpose, that it has stimulated inquiry, and we look forward with interest to the new light which will, we hope, be thrown on the few points left unsolved by us, when the Committee of the British Medical Association shall publish the results of their investigations, and the Royal College of Physicians the successful essay for which a prize of £100 has been offered.

The favourable reception accorded to our report has

induced us to publish it in a more permanent and convenient form. Rabies should have more than an ephemeral interest, though it, unfortunately, has ever been the case, that public curiosity is only excited when the destructive ravages of a disease are felt or apprehended. It will, we hope, prove useful in dispelling some of the prevailing errors in reference to this sad affliction, and in educating the public more fully on the subject.

Personal opinion and authority in medicine always have had a value. We can vouch for part of the work as the production of one who has had large experience, and who writes with a thorough acquaintance with his subject.

For the rest, we leave our readers to judge, and shall feel satisfied if by our labours we have added but one fact to the storehouse of medical knowledge.

May 1*st*, 1878.

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THE NATURE AND TREATMENT

OF

RABIES OR HYDROPHOBIA.

CHAPTER I.

INTRODUCTORY.

SCATTERED through the pages, both of special monographs and of the different medical journals since the year 1800, are numerous cases under the name of hydrophobia, but they are virtually buried along with other valuable literature, being accessible only to the possessors of good libraries, or to those who have access to a large public library; even then requiring time, patience, and labour for the task of disentombment. In many cases we have only, unfortunately, the conventional records that appear in the daily papers; as, for instance, the coroner receives information of the death of some person who is reported to have died of hydrophobia in a most malignant form. The evidence establishes that as the deceased, may be, was walking past some house, a dog rushes out and bites him; he goes at once to some surgery where the wound is cauterised, and some kind of preventive

measures are taken. The wound may heal, or may not properly heal, and in a few weeks or a few months, symptoms of hydrophobia develop, from which the patient dies, and a verdict is returned of another "death from hydrophobia." When a case occasionally occurs at an hospital, all the circumstances attending upon it are closely examined and fully reported, but the clinical records, consisting of a narration of the symptoms and treatment, are soon forgotten amongst a host of hospital reports. We have collected the majority of such cases with a special object.

The problem of the nature of hydrophobia has yet to be solved, the period of incubation is not yet accurately defined, the exact part of the organism affected is not yet clearly known, while the remedy has yet to be put to the practical test of enlarged experience before we can definitively pronounce in its favour. We may not be able to clear up satisfactorily all the points involved in obscurity, but we may materially assist, not only present, but future inquiries, by presenting them with a carefully arranged mass of statistics and *data*, for it is only by a comparison of accurately-observed facts, and by a critical appreciation of their value, that its true nature can be determined.

Fonssagrive,* Professor of Hygiene at Montpellier, expresses himself thus tersely on the value of statistics: "La statistique bien faite est bonne, la statistique mal faite est mauvaise, c'est une levier qui soulève la pierre sous la quelle est la vérité, ou qui laissant-retomber elle emprisonne plus etroitment; la chiffre tue, l'interpretation vivifie;" and bearing in mind the truth of these words, we have not alone massed together a number of dry figures, but have also given the leading features of the different cases, from which to draw inferences, to vivify and interpret them by the light of modern scientific medicine. We have not forgotten the

* "Hygiène des Villes," p. 7.

literature of this subject antecedent to 1800, but will select the chief facts from it in a careful summary.

The history of the past and its records should teach us valuable lessons in regard to accuracy in reporting and diagnosing this affection, in the application of medicines and their value, in the power of preventive measures and the precautions to be taken in every case of a bite from any kind of animal. Many cases supposed to be rabies will have to be excluded from that category, owing to errors in diagnosis arising from confounding with it tetanus, acute mania, and certain forms of cardiac disease, and pericarditis. We must briefly dwell on these points. Medical practitioners cannot be too careful in their diagnosis, and medical journals owe it as a duty to the public not to insert any observations under the nomenclature of hydrophobia, unless there is the clearest evidence as to the accuracy of the designation. The "Lancet" of September 22, 1877, affords a striking illustration of the necessity of observing this rule, for in its columns we find the notes of a case with the heading, "Hydrophobia, or its Eikon, which?"

The question of the nature of the disease is answered by the last sentence in the report: "The immediate cause of death was presumed to be cessation of the large, thin, flabby heart's action, resulting from exhaustion consequent on the previous nervous or cerebral excitement." We may add to this, as the head was not examined, that the cause would have been found there. We cannot understand why the name of hydrophobia is at all introduced. In the nineteenth century we should not perpetuate the errors of the eighteenth; but there evidently seems a danger of an epidemic of mania in regard to writing about hydrophobia, and of appending this appellative in place of the proper one. Fifty years ago* Dr. Whymper recorded some cases affording us a striking

* "Medico-Chirurgical Review," vol. iv. p. 318.

example of the development of a train of phenomena closely resembling rabies, without the bite of a rabid animal, and purely depending upon structural cardiac alterations.

One of his patients, a soldier, plunged into a river whilst perspiring profusely, and after being heated in the sun. During the night he felt chilly and unwell, and towards morning he complained of a severe sense of weight in the upper part of the thorax of the left side, with a benumbed pain down the left arm. When he was conveyed to the hospital at Dublin he had extreme anxiety of countenance, irritability of manner, pain and great oppression under the five upper ribs of the left side, with obtuse pain in the shoulder and arm; pulse irregular, intermittent, oppressed, and wiry; breathing slow and laboured; much thirst, yet resistance to drink, as he said the attempt took away his breath. After thirty hours of such symptoms, a state of rapid collapse succeeded, the nervous excitability suddenly ceased, respiration became natural, he swallowed whatever was given him with ease, sank into a state of syncope, and expired. There can be no doubt this was not a case of rabies, for the symptoms were referable to cardiac derangement; and on dissection, the muscular substance of the heart was found so flaccid, that it could be torn as easily as soaked pasteboard.

In connection with the same case, we have also an example of how nervous influence and powerful moral emotions, deranging the functions of the heart and respiratory organs, may produce symptoms simulative of rabies. The man who attended on the last patient, and who had witnessed the fatal scene, was himself admitted to hospital some time after, presenting nearly the same phenomena, but in a much milder degree. He had also a great dislike to drink, as he said it took away his breath. After a short time he recovered and left the hospital, but returned again, having a remarkable

hesitation of manner and speech, with constant dyspnœa, palpitation, asthmatic paroxysms, assigned to pulmonic disturbance. In reality, the patient was labouring under cardiac derangement, the phenomena appearing in the organs of respiration, the cause being in the heart.

The same form of disease still exists, though it is comparatively rare, and medical men should bear this in mind, and guard against confounding it with rabies. The patient suffers from excitement, dyspnœa, difficulty in swallowing, and death generally takes place in four or five days; and thus, unless these facts are borne in mind, the medical practitioner may be puzzled until he has recourse to auscultation. Hydrophobia is said to be increasing; but we must bear this important fact in mind, so are nervous diseases, so is insanity —our public asylums are nearly all filled. There is no doubt in the past many cases have been called hydrophobia that were simply cases of acute insanity. We have lingered on this point owing to the great importance of arresting reports, based on mistaken diagnosis, and shall have to return to it again when we are dealing with the symptoms of rabies.

Our general statistics will throw light to a certain extent on the period of incubation, on such disputed points as whether rabies can arise from the bite of an animal which is not rabid, whilst the notes of *post-mortem* examinations will afford a certain standard of comparison, and help us by revealing where morbid phenomena have been principally observed.

As we have said, we have made this compilation in the hope of assisting other investigators, and as the husbandman, when he plants an ash, a yew, or an oak, does not expect them to develop into their fulness in his own time, but plants them for the good of those who will come after him, so our efforts and labour may prove useful and benefit

posterity. In introducing the subject, we have thought it better to plunge at once *in medias res*, to set down a stern array of facts, and then analyse their value and form a critical appreciation of them. We might have commenced with its history from the earliest ages, with an interesting bibliographical sketch, but that portion we shall leave for the end, as being the easiest and least practical.

Some special questions springing from the general questions will have to be examined, as :

1. Can hydrophobia arise spontaneously in the lower animals ?

2. Is it true that hydrophobia can be communicated only by those animals who use their teeth as weapons of defence ?

3. May it originate spontaneously in the human species ?

4. Can the disease be communicated from one human being to another, or by the human species to other animals ?

5. Are there any facts showing that the poison may be introduced without a bite ?

6. Is the evidence of Girard* and others who deny the existence of a specific poison satisfactory ?

We shall then have to consider the effect of treatment and preventive measures ; and under the latter head to contrast the effect produced by bites of rabid animals on persons who have been bitten and had their wounds promptly attended to, and also the effect on those who being bitten, have not adopted any precautionary measures, and estimate the proportionate amount of immunity conferred thereby. We believe there will be satisfactory *data* to prove that, as vaccination has a powerful and positive influence in preventing small-pox, so (though not in similar manner) preservative measures after a bite have had a beneficial effect in arresting

* "Sur la non-existence du Virus Rabique" : Girard 1827.

rabies. The statistics furnished afford clear and positive evidence that it does not follow that hydrophobia will develop from the bite of a mad dog, for as the poison of cholera, typhoid fever, and diphtheria does not affect certain organisms, so the poison of a rabid animal seems inert in certain systems. Hunter* mentions the well-known case of twenty-one persons being bitten, one of whom only suf fered; and Youatt, who is deservedly looked upon as one of the best authorities on canine madness, was himself bitten five times, and cauterised the wounds of 400 persons who were also bitten by rabid animals, without any bad result. Dr. Ekstrom, of Stockholm, reports an epidemic in that town in 1824, when 106 persons presented themselves at the Royal Hospital, Stockholm, bitten by animals supposed to be rabid, and out of that number only one, who did not attend to his wounds, contracted the disease. Considering the number of persons bitten in Great Britain every year, it affords us a modicum of consolation that the proportion of real cases of rabies are conparatively few. The knowledge of such facts should soothe the public mind, which unfortunately becomes needlessly alarmed by hearing and reading sensational paragraphs about this disease. From the most remote period, rabies has been enshrouded in a veil of mystery, its terrors and its symptoms being intensified by popular ignorance and superstition. It would be difficult to explain the reason why it has occupied this exceptional position, or why a death from rabies should be considered more terrible than a death from tetanus.

It has been fortunate for humanity that other diseases have not been treated in the manner in which Abernethy lectured on hydrophobia. His lectures afford a striking illustration of the wrong position taken by many surgeons in reference to it. As a dead worthy of our profession we

* Hunter, Letter to Dr. Hamilton, 1785.

do not like to cast any aspersion on his memory, but we must attribute a certain amount of blame to any lecturer who could treat such an affection as hydrophobia in the jocular style of this eccentric, but otherwise eminent, surgeon. His remarks read like a parody at the present day, and we are thankful that they were not the views of all the surgeons of his time. With reference to the treatment, he says: "I have nothing satisfactory to offer; bleeding has been recommended, copious bleeding, but when I heard of it, I said, they might bleed me if they liked, and thank them too, for if I was conscious of labouring under the disease, I should have so little hope of recovery that I should be inclined to do as Seneca did, open my veins and sit in warm water, although I suppose from the dread of it, I should not be allowed the luxury of dying in a warm bath. There have been other remedies proposed, but none of these appear sufficiently established to enable me to recommend them to you; you must read of them and judge for yourselves. *Indeed, what can we give a man when he cannot swallow, even if we had remedies?* It is of some use to keep the bowels open, and keep the patient quiet; and there is that croton-oil which is useful to procure purgation, which we could not do before, for a single drop of it put on the tongue acts upon the bowels. A pamphlet has just been published about the appearance of pustules under the tongue, and that cutting them out will prevent the disease. I do not know anything further about that; you will no doubt read it for yourselves." The students who listened to such a lecture must have carried away erroneous impressions, which, in their turn, they would perpetuate; and if they were admirers of Abernethy, would come to the conclusion that it was useless to read or to try any remedy for a disease which their master had pronounced hopeless and incurable. But if such a system of instruction were tolerated, surgical pro-

gress would be at an end, ovariotomy would not be a standard operation, and many lives now saved would have been lost.

Disease and death are the heirlooms of humanity, and our mission is to contend with misery, with pain, with suffering, and wrestle with our enemies, whether in the shape of epilepsy, tetanus, hydrocephalus, or variola. We often succeed, but often are foiled. Death, the victor, triumphs over our skill, and it becomes our painful duty to witness the struggles which what we call Life undergoes before the spirit leaves the frail tenement which holds it; and this we oftentimes see in its worst forms in the death-throes that end such diseases as epilepsy, tetanus, and infantile convulsions. The nature of many diseases are as yet unknown; the causes are at present beyond our comprehension; but, undiscouraged, we persevere and engage in the task of unravelling the secrets of Nature, and modern Medicine has had many legitimate triumphs, and may fairly boast of many successful victories over her grim antagonist—Death. Rabies is but one of the manifold affections to which humanity is liable, and it is our duty to investigate it in the same manner as we have done other maladies; and had we not in the past recognised the necessity of not being daunted by failure, medicine would have made but little progress. In such a spirit rabies must be studied, dismissing all prejudices and old traditions, anxiously gaining all the information we can respecting the conditions under which it is developed, and the means by which it may be prevented. To this end the strictest investigation should be made into every particular when a practitioner has a case under treatment. All the circumstances under which the patient was bitten, whether on the naked flesh or through articles of clothing, whether the animal was mad or had bitten other animals, whether the person was the first or last bitten must be noted. The

nature of the precautions taken after the bite, and the promptitude with which they were adopted, the constitution, habits, and general health of the person attacked—all these and other questions should be carefully inquired into, so that we may in time obtain a larger accumulation of facts bearing upon the natural history of the disease, which may cast a greater flood of light upon its prognosis and prevention.

The superstitions respecting hydrophobia have lasted longer in popular belief almost than those of any other disease ; and in a special chapter on the curiosities of the literature of the subject, we shall enumerate many of them. Quacks of all kinds have not failed to avail themselves of popular ignorance, and by the boasted possession of mysterious remedies to prevent the operation of the virus, have, as Sir Thomas Watson says, sold their nostrums at no cheap rate to those who, having been bitten by the dog, are weak enough to be bitten again by the quack.

We have to make war against those vampires of modern society, who make a trade of fattening on the sufferings and weaknesses of humanity ; and this can only be done by inspiring public confidence in ourselves, and by teaching that modern medicine avails itself of every possible resource in its power to contend with this disease, and if there is any hope of recovery it must come from legitimate medicine.

We shall also have to consider the nomenclature, for the very name itself seems bestowed on the *lucus a non lucendo* principle, as Dr. Richard Mead, in his "Essay on Poisons," 1702, says : "They call it, though improperly, the hydrophobia or dread of water, but the disorders with which this is attended are related so variously, that they can scarcely be thought to belong to the same kind of malady."

Our readers cannot fail to have noticed one important omission in this chapter—that is, the name of our chief

living authority on this disease. The author of "Rabies and Hydrophobia" has simplified our task by his accurate tables and statistics, bearing on disputed points, by his lucid description of the disease in the lower animals and in man, by his valuable suggestions as to treatment, curative, preservative, and preventive, and by his bibliographical account of its history. Before our report is concluded, it will be seen how much medicine is indebted on this subject to the industry and ability of this member of an allied profession. We need hardly say we allude to the distinguished veterinarian—Fleming.

We have now shadowed forth our objects, and in this spirit we approach our task. How far we may succeed our readers will be able to judge; but though we may not be able to solve the problem, we shall certainly place it on a more rational basis, and may thus lead to a more scientific method of treatment, and a clearer comprehension of its pathology.

CHAPTER II.

GENERAL STATISTICS.

We are following, to a certain extent, the rules laid down by Dr. Abercrombie, in his Inquiries concerning the intellectual powers, and the investigation of Truth—rules which, at the present day, are apt to be neglected, but which, if observed, would materially assist in rendering the science of medicine more exact. We have, then, collected—firstly, as many statements under the head of hydrophobia as we deemed sufficiently accurate, in order, secondly, to compare these statements with each other; and, thirdly, tracing any connection between them, to draw general conclusions and inferences which may assist, not only ourselves, but further investigators in their researches on the nature of the disease we are examining.

Dr. Abercrombie tells us that we should beware of the following sources of fallacy, and they are so highly important, not only for the special question of rabies, but for all medical inquiries, that we insert them, as a fitting introduction to the mass of facts or statements we are laying before the profession. They were written in 1830, and like good wine they have lost nothing by age.

Dr. Abercrombie warns us against—

1. Receiving as facts statements which are not facts, but opinions. Thus:—A person dies after being affected with

a certain set of symptoms, and we find, on the examination after death, the usual appearances of hydrocephalus; another is seized with certain symptoms and recovers; he is therefore said to have recovered from hydrocephalus, and such a statement is often given as a medical fact. The man's recovery from certain symptoms is a fact; that he recovered from hydrocephalus is not a fact, but an opinion. We shall subsequently see the necessity of applying this rule to hydrophobia.

2. We must guard against receiving as a fact a statement which only assumes the relation of facts. A person recovers from a particular disease, while he was using a particular remedy. His recovery is ascribed to the effect of the remedy, and the cure of the disease by this remedy is often given as a medical fact. The man's recovery is a fact, and that he used the remedy is another fact, but the connection of the remedy with his recovery we are not entitled to assume as a fact. We shall also see the necessity of this rule, as, for instance, in the case of hydrophobia said to have been cured by lead.

3. We must not receive as facts, general statements, or the generalisation of facts.

One of the most common examples of this error occurs when a statement is given of a symptom or set of symptoms, as certainly diagnostic, of any particular disease, or of a particular morbid condition of an internal organ. Such a statement we hold to be of no value except we have absolute confidence in the narrator both in regard to his habits as a philosophical observer, and to the extent of his observations, on which his statement is founded. But with every possible advantage in these respects, we must exercise the utmost caution before we receive the relation thus stated as a fact; for it is to be kept in mind that it is not properly a fact, but a generalisation of facts. Some writers, for instance, have

maintained with much confidence that a particular state of rigidity of some of the limbs is distinctly characteristic of ramollissement of the brain. But further observation has shown that the disease may exist without this symptom, and that this condition of the limbs may appear in connection with other diseases. This observation of facts was in so far correct that this state of limbs does very often accompany ramollissement of the brain; the error consisted in giving it as a general fact, or a fact applicable to all cases of ramollissement, which is without foundation. Yet such statements when brought forward with confidence are often received as facts and rested upon as established principles; and then the facts by which their fallacy might be detected are apt to be overlooked or forgotten. Dr. Abercrombie indicates clearly the uncertainty of causation and generalisation in medicine, and the danger of receiving general statements as equivalent to facts. Sir W. Jenner has also insisted on these dangers. We are arming our readers even against ourselves, but we are placing them in the most favourable condition to estimate the value of our statistics, conclusions, inferences, deductions, statements and suggestions; but better for medicine that we should be checked and corrected, than that we should promulgate, as facts, what are only individual opinions.

Fully alive, both to the dangers that beset us and the importance of our task, we present some of the facts which we have to vivify and interpret.

TABLE OF CASES OF HYDROPHOBIA, SHOWING SEX, AGE, NATURE OF BITE, AT WHAT PERIOD AFTER THE BITE HYDROPHOBIC SYMPTOMS APPEARED, REMEDIES, RESULT, AND THE SOURCES OF INFORMATION.

CASE I.—John Metcalf, æt. 21, bitten in the right hand by a dog, not considered mad at the time, but affected by quinsy, from which, not having recovered, it was killed.

Result and Time of Attack.—Eleven weeks after. Fatal, first day.

Treatment.—Bleeding, calomel, mercury, opium.

Post-mortem.—Head. Brain natural, slight fulness of the sinuses and great veins of the dura mater. Spine : Preternatural vascularity, heart natural. Pharynx sub-livid, inflamed. Lungs, liver, spleen, pancreas, and outer surface of the intestines livid, but healthy.

Remarks.—There is no account as to application of cautery. The cicatrix was irregular, hard, and situate on the dorsal side of the root of the thumb.

Reference.—Med. Gazette, vol. i. p. 53, 1827. Dr. Black.

CASE II.— ——, male, æt. 30, bitten by a cat, not seemingly rabid, on the right finger of the left hand and on the calf of the leg.

Result and Time of Attack.—Ten weeks. Fatal, first day.

Treatment.—Bleeding, belladonna, laudanum.

Post-mortem.—Twenty hours after death ; arachnoid membrane of the brain, opaque, thickened, congested—the same in the spinal cord. Back of fauces and throat darker than usual, the heart flaccid, muscular substance soft, contained no blood. No very striking appearance in other parts of body.

Remarks.—He refused to have the injured part excised when he came to St. Bartholomew's next day. His child was also bitten on the hand ; but though the wound was not excised, he did not suffer.

Reference.—Med. Gazette, vol. i. p. 517, 1827. Dr. Hue.

CASE III.— ——, male, bitten on the calf of leg—wound healed in three days. Recovery.

Remarks.—For four days he laboured under all the ordinary symptoms of hydrophobia ; the dog returned on the ninth day free from disease, and from that time the man recovered. An instance of fear exciting symptoms resembling Rabies.

Reference.—Med. Gazette, vol. i. p. 582, 1827. Giornale di Fisica.

CASE IV.— — Barham, male, æt. 60, bitten by a strange dog in the left arm and hand.

Result and Time of Attack.—One month after. Fatal, second day.

Treatment.—Bleeding, Prussic acid.

Post-mortem.—Cranium, thin—numerous red spots in the medullary portion of brain, a tablespoonful of water in each ventricle, the choroid plexus turgid. The corpora striata, thalami, and base of the brain injected. The cerebellum, crura cerebri, in a high state of inflammation. The spinal cord considerably inflamed. The preparation of the cord is in the Museum of the London University.

Remarks.—This patient died in total ignorance as to the cause of his malady, as he did not attach any importance to the wounds, which were perfectly healed.

Reference.—Med. Gazette, vol. iii. p. 123, 1828. Dr. Godrich.

CASE V.— — Courbouloy, male, æt. 28, bitten on the right thumb by a dog, whose state of health was not known.

Result and Time of Attack.—Six weeks afterwards. Fatal, in twenty-four hours.

Treatment.—Bleeding, calmatives, leeches.

Post-mortem.—Twenty-one hours after death the cicatrix was carefully examined. The subjacent cellular tissue was not injected, and the nerves from the spot up to the brachial plexus presented their natural colour and consistence. The cellular tissue, inferior to the dura mater, was infiltrated with blood, the sinuses gorged with fluid blood. The arachnoid covering the spinal marrow was uniformly red and raised by a layer of thick serosity. The internal surface of the dura mater was not red. No other appearance in the brain worth recording. Uniform redness of mucous membrane of trachea and pharynx. Nothing else particular in chest or stomach.

Remarks.—This patient had not any horror of liquids, and attributed his symptoms to eating fish.

Reference.—Med. Gazette, vol. iii. p. 819, 1828. *Journal Hebdomadaire*, D. Cousture, Vidal, and M. Pages.

CASE VI.—Mr. Hill, Ensign 10th Reg., bitten on the back of the hand by a dog.

Result and Time of Attack.—Three months after. Recovery.

Treatment.—Salines, aperients, blisters.

Remarks.—This was a very peculiar case; his illness lasted from Nov. 14th till Jan. 14th, and it was questioned whether it was a case of hydrophobia. It is reported on good authority, and from the evidence there can be no doubt it was a case of Rabies.

Reference.—Med. Gazette, vol. vi. p. 561, 1830. Drs. Grant and Sloane.

CASE VII.— ——, male, bitten on the hand.

Result and Time of Attack.—Three weeks after. Fatal.

Treatment.—Bleeding, mercury, injections of water *à la* Majendie.

Remarks.—Died in seventy-four hours after appearance of symptoms.

Reference.—Dr. Ekstrom, *Med. Gazette*, vol. vi. p. 690.

CASE VIII.— ——, male, æt. 40, bitten on leg.

Result and Time of Attack.—A year and a half after. Fatal in three days.

Treatment.—Mercury and other remedies.

Post-mortem.—The only remarkable appearance found on inspecting the body was inflammation of the absorbents, and considerable effusion of serum within the head.

Reference.—*Med. Gazette*, vol. vi. p. 690.

CASE IX.—Edward Boutle, æt. 46, bitten slightly on the back of the hand by a fox.

Result and Time of Attack.—Six weeks afterwards. Fatal within forty-three hours.

Treatment.—Opium, morphia, etc.

Post-mortem.—There was serous effusion between the arachnoid membrane and pia mater. The substance of the brain was increased in vascularity. Nothing unusual about the nerves. The mucous membrane of the pharynx and larynx was remarkably vascular. Lungs healthy.

Reference.—*Med. Gazette*, vol. x. p. 367, 1832. London Hospital.

CASE X.—Male, æt. 4, bitten in the face by a dog.

Result and Time of Attack.—Seven weeks after. Fatal in twenty-four hours.

Treatment.—Acetate of lead, leeches.

No *post-mortem* allowed.

Reference.—*Med. Gazette*, vol. x. p. 399. London Hospital.

CASE XI.—M. A. Fergusson, female, æt. 57, bitten on the fore-part of right arm.

Result and Time of Attack.—Three weeks afterwards. Fatal in two days.

Treatment.—Opium, camphor.

No *post-mortem* allowed.

Reference.—*Med. Gazette*, vol. x. p. 538. Mr. Badgley.

CASE XII.—Ames, male, æt. 14, bitten by a dog.

Result and Time of Attack.—Three months after. Fatal, first day.

Treatment.—Warm baths, belladonna, opium.

Post-mortem.—Brain softer than natural. Vascular turgidity.

Reference.—*Med. Gazette*, vol. xii. p. 835. Dr. Cox.

CASE XIII.— ——, female, æt. 32, bitten on the left heel by a dog.

Result and Time of Attack.—Eight days after. Recovery.

Treatment.—Bleeding, vinegar.

Remarks.—A very questionable case.

Reference.—*Med. Gazette*, vol. xiv. p. 226, 1833—34. M. Dubedat.

CASE XIV.— ——, male, æt. 6½, bitten over the eye by a rabid dog.

Result and Time of Attack.—Five weeks afterwards. Fatal fourth day. Part excised after a few days.

Treatment.—Blisters, morphia, vaccine.

Post-mortem.—There is a very long account of *post-mortem*, with a plate representing the morbid appearances; the pharynx was considerably inflamed. The œsophagus inflamed near its termination. The whole of the nervous system was remarkably developed.

Reference.—Transactions of the Pro. Med. Surg. Ass., vol. ii. Mr. R. B. Grindrod. *Med. Gazette*, vol. xiv. p. 358.

CASE XV.— ——, male.

Result and Time of Attack.—Two years after. Fatal.

Remarks.—Inquest held at Westminster, by Mr. Higgs, coroner. The verdict was that the deceased had died of hydrophobia, the supposed cause of which was the bite of a dog received two years ago. An instance of imperfect evidence, for we cannot, on the few notes we have found of this case, admit the period of incubation.

Reference.—*Med. Gazette*, vol. xvi. p. 768, 1835.

CASE XVI.—Victor Le Gras, male, æt. 19, bitten by a cat.

Result and Time of Attack.—Hundred-and-one days after. Fatal in four days.

Treatment.—Bleeding.

Reference.—*Med. Gazette*, p. 703, vol. xvi.

CASE XVII.—Edward Lloyd, æt. 11, bitten on leg by a dog supposed mad.

Result and Time of Attack.—Four months afterwards. Fatal, second day.

Treatment.—Calomel, opium, mercury, etc.

No *post-mortem.*

Reference.—*Med. Gazette*, vol. xvii. p. 269, 1836. Mr. Thornhill.

CASE XVIII.—Joseph Robbins, æt. 20, bitten on thumb by a strange dog.

Result and Time of Attack.—Ten weeks after. Fatal in forty-two hours and a half.

Treatment.—Calomel, mercury, tobacco, belladonna.

Post-mortem.—Sinuses of brain gorged with blood. Effusion

of serum between the arachnoid membrane and pia mater, and about an ounce of fluid in the lateral ventricles. The choroid plexus of a dark colour. The medulla oblongata injected. The theca vertebralis highly vascular and injected. The medulla spinalis in a very softened state, and the larynx, trachea, and bronchiæ congested, lungs congested. Heart, pale soft. Congestion of most of the other organs.

Remarks.—This patient did not lose his senses, nor ever allude to the bite.

Reference.—Med. Gazette, vol. xvii. p. 812, 1836. Mr. F. Pritchard.

CASE XIX.—Elizabeth Rollins, æt. 37, bitten on left arm and ankle.

Result and Time of Attack.—Seven weeks after. Fatal, second day.

Treatment.—Croton oil, hot-air baths, morphia, etc.

No *post-mortem.*

Reference.—Med. Gazette, vol. xviii. p. 55. Dr. W. England.

CASE XX.—G. Nichols, æt. 17, bitten on the right wrist by a spaniel, supposed mad. He was recommended to have the part excised, but did not do so. Wound healed in a few days.

Result and Time of Attack.—Six weeks after. Fatal, second day.

Treatment.—Belladonna, bleeding, injections of tobacco.

Port-mortem.—Eighteen hours after death. Vessels of the pia mater distended with dark blood. Substance of the brain rather more injected than usual. Heart healthy. Congestion of the lungs. The glandulæ solitariæ, both in the large and small intestines, hypertrophied. Tonsils enlarged. A cluster of hypertrophied mucous follicles, presenting a grey appearance on the under surface of the epiglottis. Pharynx and larynx highly injected. Several mucous follicles on the lining membrane. Two worms found in the intestines (ascari lumbricoides). Nothing particular in the cicatrix of the bite in the wrist. Mr. Curling has put this query : Did the worms act as the predisposing cause of the disease ?

Reference.—Med. Gazette, vol. xviii. p. 736. F. Blizard Curling.

CASE XXI.—Edward Lynch, æt. 26, bitten by a dog on the cheek and upper lip. Not known whether mad or not. Lip excised. Nothing done to the wound on the cheek.

Result and Time of Attack.—Five weeks after. Fatal, second day.

Treatment.—Carbonate of iron, morphia.

No account of *post-mortem.*

Reference.—Med. Gazette, vol. xxi. p. 75. Mr. Jones, Dr. Babington, Westminster Hospital.

Case XXII.—William Hays, æt. 28, bitten on the hand and fingers by a dog. Not known whether mad or not.

Result and Time of Attack.—Two months afterwards. Fatal, second day.

Treatment.—Opium, morphia, etc.

Post-mortem.—The spinal column was opened and the whole of the spinal marrow was exposed, but there was no appearance of disease; nothing remarkable in the brain and its membranes, except a slight partial thickening of the arachnoid and a little fluid; slight but decided vascularity of the pons varolii and medulla oblongata. The surface of these parts was injected with bright red vessels. The membrane of fauces and root of the tongue rough and irregular from enlargement of the mucous glands. The mucous membrane of the œsophagus was in some parts abraded, and in other parts its superficial interior lining had the appearance of a fine false membrane. Mucous coat of the stomach softened. Small intestines healthy. Epiglottis, every part of larynx, and trachea, congested. Great fluidity of blood.

Remarks.—It was questioned at the time whether this was hydrophobia, by persons not only of general experience, but who had seen hydrophobia before.

Reference.—Med. Gazette, vol. xxi. p. 205. Dr. F. Hawkins, Middlesex Hospital.

Case XXIII.—L. ——, male, bitten on the upper part of the left arm by his own dog.

Result and Time of Attack.—Two years after. Recovery.

Treatment.—Salivation, bleeding, hydrocyanic acid.

Remarks.—This case has also been disputed, as it was said it was mania or inflammation of the brain. The dog was not mad, and so long a time had elapsed since the bite. Dr. Du Neaume asks if this be not a case of rabies, what was it?

Reference.—Med. Gazette, vol. xxi. p. 539. Dr. Du Neaume.

Case XXIV.—F. Metcalf, male, æt. 18, bitten on outside of his right hand and palm by a dog.

Result and Time of Attack.—Five months after. Fatal, in forty-six hours.

Remarks.—A very interesting case, well described.

Reference.—Dr. Moseley's pamphlet. 1807.

Case XXV.— ——, male, æt. 17, bitten by a dog on middle finger of right hand.

Result and Time of Attack.—One month after. Fatal.

Reference.—Prof. Plummer's pamphlet. 1809.

Case XXVI.—Hannah Lacase, æt. 30, bitten on little finger by a mad dog.

Result and Time of Attack.—Fifteen days after. Recovery.

Treatment.—The physician removed the skin where wound had

been, and a drain was instituted. She was rubbed with ung. mercurial. fort.

Remarks.—The author gravely says: "This is the only case of complete hydrophobia from the bite of a mad dog successfully treated on record." Dr. Moseley evidently overlooked the case of hydrophobia, successfully treated by Dr. Arnold, of Leicester, and reported by him in a pamphlet of 245 pages, published in 1793, every detail of which is elaborated with almost tedious minuteness.

Reference.—Dr. Moseley's pamphlet. 1808.

CASE XXVII.—Thomas Ottar, æt. 34, bitten on the hand by a dog supposed to be rabid.

Result and Time of Attack.—Two weeks after. Fatal, second day.

Treatment.—Morphine.

Reference.—*Dublin Medical Press*, p. 641. 1862.

CASE XXVIII.— ——, female, Rupert Street, Piccadilly.

Result and Time of Attack.—Twelve days after. Recovery.

Remarks.—Dr. Lipscomb in reporting this case asserts that the symptoms were most decidedly marked, and as he believed the only hope presented by experience lay in the speedy and immediate influence of mercury, he salivated his patient by inunction of strong mercurial ointment. He recommends its use in every case either by ordinary inunction, by fumigation, or by rubbing calomel on the inside of the cheeks near the orifices of the parotid ducts, so as to be applied, as he says, "to the principal seat of the disease;" mercury has been tried and failed as a specific.

Reference.—Dr. Lipscomb's pamphlet. 1809.

CASE XXIX.—Mary B., æt. 8, bitten on the right leg.

Result and Time of Attack.—Twenty-eight days after. Fatal.

Treatment.—Opium, chloroform.

The *post-mortem* disclosed no lesion whatever.

Reference.—*Lancet*, p. 511. 1866. Mr. Hutchinson.

CASE XXX.— ——.

Remarks.—Acute laryngitis may occasionally be mistaken for it. Mayo notes that such a case occurred at the Middlesex Hospital, and a doubt existed as to the nature of the complaint. After death it was cleared up by the previous history and by the intense inflammation of the larynx found at the *post-mortem*.

CASE XXXI.— ——.

Remarks.—Dr. Bardsley, of Manchester, has related a case where a female servant, without any ostensible object, applied some irritating substance to one of her legs, asserted that she had been bitten by a suspicious dog, and afterwards exhibited a train of hysterical symptoms, some of which assimilated with certain

phenomena attendant on hydrophobia. This the Editor, *Med. Chir. Review* (vol. v. p. 261), does not call simulation, but a species of mental aberration in a nervous female inducing acts which it was not in her power to resist.

CASE XXXII.— ——.

Remarks.—Vidal also points out the necessity of the practitioner remembering acute laryngitis, to save himself from making a cruel mistake, and he illustrates it by the following history, which he says will never be effaced from his memory:

"In a hospital in a large town a patient had died, really of rabies. A short time afterwards a man suffering from very intense angina was received into the same hospital, and placed in the same ward. The physician was told by the pupil in charge that he had received a patient who had refused to drink; the idea of rabies at once presented itself to his mind. He visited his patient and tells him to drink, the patient replies that he cannot, as it is impossible for fluids to pass down his throat. The physician insists, the patient refuses; force is employed, and he defends himself. He is bound, convulsions ensue; he is cauterised beneath the tongue, and dies during the day. The autopsy revealed the real nature of his affection." As Vidal says, after such details comment is unnecessary.

CASE XXXIII.—George Cubit, æt. 17, bitten on hip by a dog, no reason to be believed mad.

Result and Time of Attack.—Seven years after. Fatal, in forty-four hours.

Treatment. — Belladonna, blisters, morphia endermically, brandy, etc.

Post-mortem.—Thirty-six hours after death. Brain and spinal cord; slight aqueous effusion underneath the arachnoid membrane and in the ventricles, and a larger quantity in the spinal sheath. The cut surfaces of the brain showed numerous bloody points, and the membranes of the medulla spinalis were abnormally vascular, without any change in their organisation. The pharynx, larynx, and trachea were highly vascular. The lungs congested, the other viscera presented no abnormal appearance.

Reference.—*Med. Gazette*, vol. xxi. p. 100. Dr. Burne, Westminster Hospital.

CASE XXXIV.—Thomas Chester, æt. 72, bitten on the middle and index fingers of the right hand by a dog not rabid.

Result and Time of Attack.—Fifteen months after. Fatal, in forty-eight hours.

Post-mortem.—Thirteen and a half hours after death. Brain and nerve surface normal, numerous bloody points in the medullary substance. Pneumogastric nerves normal. The superior cervical ganglion of the sympathetic was supposed to be of a deeper reddish-brown than usual. Vascularity of pharynx, larynx, and trachea. Lungs congested, and the heart soft, flabby,

and lacerable. Stomach and alimentary canal normal. Blood black, thick, and not coagulated. From the evidence and descriptions, we do not consider these two cases as instances of rabies.

Reference.—*Med. Gazette*, vol. xxii. p. 103. Dr. Burne.

Case XXXV.—Anne Jameson, æt. 53, bitten on the right hand and fingers by a terrier supposed to be mad, wounds were excised and cauterised shortly after.

Result and Time of Attack.—Two months after. Fatal, second day.

Treatment.—Opium and ammonia.

Post-mortem.—Inflammation of membranes of spinal cord. Brain and membranes healthy, except some ossific deposit, on falciform process of the dura mater, and effusion in the choroid plexus of the left side. Membrane of pharynx and upper part of œsophagus and stomach inflamed. All the other viscera healthy.

Reference.—*Med. Gazette*, vol. xxiii. p. 62, 1838, 1839. Mr. Holt, St. Bartholomew's Hospital.

Case XXXVI.—Rugheem Ling, Sepoy, 51st Native Infantry, bitten on the leg.

Result and Time of Attack.—One month after. Recovery.

Treatment.—Iodine.

Reference.—*Med. Gazette*, vol. xxvi. p. 548. Dr. Rankin.

Case XXXVII.—Charles Havens, æt. 13, bitten by a dog on the right hand, small wound, healed in three days.

Result and Time of Attack.—Fifty days after. Fatal, in fifty hours.

Treatment.—Cannabis, Prussic acid, beef-tea, etc.

Post-mortem.—There was a small quantity of serum in the spinal canal, the membranes and cord being apparently healthy; the posterior spinal veins were less turgid than in many cases, although the body had been lying on the back since death; the membranes of the brain were apparently healthy, and there was no effusion in the arachnoid or subarachnoid cellular tissue. Both substances of the brain were congested, and of a darker colour than usual, the grey matter presented a marked pinkish colour, especially that portion in contact with the pia mater. The ventricles did not contain more fluid than natural. The cerebellum, pons varolii, and medulla oblongata were congested, but not more marked than other portions of the brain. The substance of the medulla was examined under the microscope by Mr. Toynbee and Mr. Hewitt, but presented nothing remarkable, the different parts of the brain were somewhat softer than usual, but this softness was general, and most probably attributable to the time of the patient's death and the state of the weather. The mucous follicles at the base of the tongue were very large and numerous, and the mucous membrane of the fauces and pharynx congested. The discoloration did not extend beyond the level of the superior

margin of the thyroid cartilage. Below this the mucous membrane of the pharynx and the œsophagus was of its natural colour; the mucous membrane of the windpipe was but slightly congested. General congestion of the other organs. Both pneumogastric nerves were throughout their whole extent minutely examined, but they presented nothing remarkable; "exactly such is the usual result of examination after death, and very nearly similar to this is the evidence afforded in the examination of the rabid dog."

Reference.—Med. Gazette, vol. xxxiv. p. 417. Cæsar Hawkins, 1844.

Case XXXVIII.— ——, male, æt 29, bitten on the inside of one of his fingers; small wound. The dog was destroyed by a veterinary surgeon, who said it was mad. Wound was excised at the time.

Result and Time of Attack.—Nine months after. Fatal.

Treatment.—Bleeding. A proposition was made that the curara (Wourali) poison should be used as a remedy, but it was not carried out.

No *post-mortem*.

Reference.—Med. Gazette, vol. xxxvi. p. 211.

Case XXXIX.— ——, male, æt. 37, bitten in the thumb by a dog, which died the day after.

Result and Time of Attack.—Five weeks after. Fatal, second day.

Post-mortem.—There was slight hyperæmia of the spinal cord and its membranes, and the red spots on the medullary substance of the brain were more numerous and larger than usual.

Reference.—Med. Gazette, vol. xxxvii. p. 843.

Case XL.—Samuel Soring, æt. 35, bitten by a spaniel.

Result and Time of Attack.—Three months after. Fatal, first day.

Treatment.—Belladonna, mercury, cupping, lead.

Reference.—Med. Gazette, vol. xl. p. 136. Dr. Addison.

Case XLI.—Emmanuel Soult, bitten under the right eyelid by a mad dog.

Result and Time of Attack.—Two months. Fatal, second day.

Treatment.—Prussic acid, cold baths, etc.

Post-mortem.—Fifteen hours after death. There was congestion of the brain, spinal cord, and membranes. The cerebral substance was somewhat softer than usual. The bronchial tubes and lungs were congested, the pharynx injected, and its follicles rather large.

Reference.—Med. Gazette, vol. xl. p. 137. Dr. Todd.

Case XLII.—Female, Maltese lady, bitten on the hand by a cat, which had been bitten twenty-four days before by a mad dog.

Result and Time of Attack.—Three months and a half. Fatal.

Treatment.—Cicatrix excised, ether, belladonna. The treatment here shows the beginning of the new era opening for medicine—in the suggestion of ether and the abandonment of old remedies.

No *post-mortem.*

Remarks.—This case is a most interesting one. Hydrophobia was not known in Malta, and there is no word for it in the Maltese language. None of the women or the patient had ever heard of canine madness, no fear was excited, and consequently imagination could not have a share in producing subsequent symptoms.

Reference.—Med. Gazette, vol. xl. p. 212. T. Spencer Wells, 1847.

Case XLIII.—John Henderson, æt. 14, bitten on the chin and upper lip by a mad dog.

Result and Time of Attack.—Nine weeks after. Fatal.

Treatment.—Chloroform, which had a powerful influence in modifying the symptoms.

No *post-mortem.*—Dr. Smyly also abandoned the old system.

Reference.—Med. Gazette, vol. xlii. p 643. Dr. Smyly.

Case XLIV.—John Loyd, 54th Regt., æt. 28. The evidence as to any bite was not clear. He was supposed to have been bitten by a puppy, which had no signs of being ill at the time.

Result and Time of Attack.—Fatal, in twenty-four hours.

Treatment.—Cold baths and Prussic acid.

Post-mortem. Forty hours after death. The brain was found natural, spinal marrow soft as jelly in parts. The mucous membrane of pharynx and larynx presented throughout a flesh-red colour, and the sebaceous glands at the root of the tongue were unusually large. The œsophagus was natural, the blood was dark and grumous, of the colour and consistence of hot pitch.

Reference.—Med. Gazette, vol. xliii. p. 932. 1849. Dr. Dawson.

Case XLV. Francisco Napolitano, æt. 16, bitten badly in various parts of the body.

Result and Time of Attack.—Three months after. Fatal, second day.

No *post-mortem.*

Remarks.—It is remarkable that four cases of hydrophobia occurred in Malta in 1847, while only two had appeared during the preceding forty-seven years, one seen by Dr. Franklin, 1805, the other by Dr. Grieves, 1805. Compare case of Spencer Wells, No. XLII., page 33. According to Spencer Wells a rabid dog arrived in an English vessel in 1846.

Reference.—Med. Gazette, vol. xliii. p. 932. 1849. Dr. Dawson.

Case XLVI.—David Lichgow, æt. 30, bitten slightly by a dog, no scar remained.

Result and Time of Attack.—A month or two after. Fatal, second day.

Treatment.—Morphia.

Post-mortem.—Twenty-two hours after death. The mucous membrane of larynx was of a deep red, the lower part of the epiglottis scarlet. The medulla oblongata was white and longer than natural. Large clots of blood were seen in the cineritious portion.

Reference.—*Med. Gazette*, vol. xliv. p. 345. Dr. Jackson, 1849.

Case XLVII.—— Burrows, female, æt. 30, bitten on the hand slightly by a dog.

Result and Time of Attack.—Three months after. Recovery.

Treatment.—Cicatrix cut out, chloroform.

Reference.—*Med. Gazette*, vol. xliv. p. 346. Dr. Jackson.

Case XLVIII.—W. H. B., æt. 18, bitten on the wrist by a dog.

Result and Time of Attack.—Three months after. Fatal, third day.

Treatment.—Chloroform, which slightly retarded the progress of the disease.

Post-mortem.—Eighteen hours after death. The brain and spinal cord were highly injected, but otherwise healthy. The trachea and bronchi were inflamed, and the epiglottis very large.

Reference.—*Med. Gazette*, vol. xliv. 346. Dr. Parkman.

Case XLIX.—Samuel Pownall, bitten by a cat above the wrist.

Result and Time of Attack.—Seven weeks. Fatal.

Treatment.—Wound cauterised, dressings after, to keep it open.

No *post-mortem.*

Remarks.—Report taken from Stockport paper.

Reference.—*Lancet*, vol. iii. p. 383.

Case L.—W. D., male, æt. 77, bitten by a dog supposed to be mad, above the wrist. Wound cauterised.

Result and Time of Attack.—Two months. Fatal, third day.

Treatment.—Opium, ten-grain doses of super-acetate of lead, nux vomica, bleeding, injection *à la* Magendie.

Post mortem.—The head—surface of the convolutions vascular. In the lateral ventricles about three drachms of fluid were found. On turning out the brain there were several projecting bony ridges from the phenoidal fossa, and two on the basilar process of the occiput. On section of the thalami nervorum opticorum, the left thalamus was of a greenish tint, and the locus niger had a similar appearance. This had been noticed before, in a person

who died of tetanus, by Mr. Key. The spinal marrow.—Three small ossific deposits were found between the fifth and eleventh dorsal vertebræ. The mucous membrane of trachea and bronchial tubes were coated with a dark-coloured mucus. The mucous membrane of the stomach was of a reddish colour, and there were large spots of extravasated blood on it.

Remarks.—This was the first case in which Magendie's method was adopted. A very common practice then in vogue is mentioned, one to be condemned: Dr. Blundell blew suddenly in the patient's face, causing him to start up in agony, and to express himself very strongly against the doctor for the torture he put him to. Some of the saliva taken from this patient was introduced into a dog's thigh without any result.

Reference.—Lancet, vol. iv. p. 373. Guy's Hospital.

Case LI.—J. L. Guilleman, bitten by a wolf on back of hand.

Result and Time of Attack.—A month. Fatal, in fifty-four hours.

Treatment.—Wound simply dressed. Bleeding, injection of blood *à la* Magendie.

No *post-mortem.*

Remarks.—This wolf had also bitten a young man who did not suffer. M. Magendie has himself appended some observations to this case.

Reference.—Lancet, vol. iv. p. 18.

Case LII.—C. D., male, æt. 13, bitten on the ball of the right thumb by a little dog.

Result and Time of Attack.—One month afterwards. Fatal, second day.

Treatment.—Tobacco.

Post-mortem not completed, as the friends would not allow the examination to proceed farther.

Remarks.—Mr. Morgan threw some cold water on this patient's face, which brought on convulsions. A most reprehensible practice.

Reference.—Lancet, vol. vi. p. 285.

Case LIII.—Charles Roberts, æt. 42, bitten on the thick part of the right thumb by a bull-terrier dog.

Result and Time of Attack.—Ten weeks after. Recovery.

Treatment.—Large doses of Goulard's extract of lead. Venesection; similar treatment has not succeeded in other cases, and we look upon this reported case of recovery with distrust. The evidence is not satisfactory.

Remarks.—This patient suffered from paralysis from the use of the lead, which disappeared after a little time.

Reference.—Lancet, vol. vi. p. 343. The account of this case first appeared in the *Morning Herald.*

Case LIV.—John Duckworth, æt. 15, bitten on the second

phalanx of the thumb by a dog. The wound not cauterised at the time. M. Lucas and Mr. Johnson considered the dog mad, but it also bit another man, and licked the wounded finger of a gentleman, who did not subsequently suffer.

Result and Time of Attack.—A month after. Fatal.

Treatment.—Bleeding, submuriate of mercury, opium, belladonna, acetate of lead.

Post-mortem.—Twenty-one hours after death. Head.—The inner surface of the calvaria was turgid with blood, the dura mater scarlet, the tunica arachnoidea opaque, the pia mater vascular, the surface of cerebellum vascular. The mouth. fauces, pharynx, larynx, natural. The œsophagus did not present any unusual appearance until it approached the cardia, where there were marks of inflammation, which extended into the stomach surrounding the cardiac orifice. The ilium was inflamed upon its inner surface about six or eight inches from its termination in the cæcum. The nerves natural, the pleura adherent on the right side, and more than a usual quantity of serum was found in the pericardium.

Remarks.—This patient was bled to about forty oz., and then nearly poisoned. He was visited by Drs. Macdonald, Jeffery, Emmerson, Halton, and Renwick, who at the beginning were conversing in the room, before the boy, about hydrophobia.

Reference.—*Lancet*, vol. vii. p. 249.

Case LV.—Francisco Farroglio, æt. 32, bitten by a cat on the left hand. The wound was cauterised superficially at the time.

Result and Time of Attack.—Forty days after. Recovery.

Treatment.—The wounds were cauterised again after the method of Rossi. The sub-lingual gland was cauterised with a small hot iron.

Remarks.—The internal use of vinegar and a decoction of genista lutea tincture were prescribed.

Reference.—*Lancet*, vol. viii. p. 245. Dr. Felice Cartagno. Remarks on case by Prof. Rossi.

Case LVI.—Boy, bitten by a dog.

Result and Time of Attack.—Three weeks after. Fatal.

Treatment.—Abstraction of blood in large quantities, and full doses of opium.

Post-mortem.—The mucous membrane lining the pharynx, œsophagus, and stomach was found to be inflamed, the membrane being the colour of wine lees. The lungs were gorged with black blood, and the bronchi with frothy mucus.

Remarks.—The principal result of the discussion at the Westminster Medical Society on this case went to show that patients had a tendency to snap.

Reference.—*Lancet*, vol. ix. p. 646. Dr. Somerville.

CASE LVII.—A. Davidson, male, æt. 23, bitten by a dog on the back part of the wrist.

Result and Time of Attack.—Ten weeks after. Fatal.

Treatment.—Bleeding, injection of ether and laudanum.

Post-mortem.—On the spinal marrow opposite to the junction of the dorsal and lumbar vertebræ, there was an ecchymosis beneath the membranes to about an inch in extent, and about this point there was distinct softening of the spinal marrow.

Remarks.—This was reported to be a case of hydrophobia, but Sir Astley Cooper said it was not. This poor patient was treated badly. The *Lancet* says that the patient laboured under mania. He was very susceptible to currents of air, and was exasperated by the blowings and sprinklings which each pupil thought proper to bestow on him. Such treatment as he was subjected to was sufficient to make any man mad.

Reference.—*Lancet*, vol. ix. p. 750. Drs. S. Back, Bright, MM. Ray, Morgan, and Callaway.

CASE LVIII.— — Miranow, male, bitten on the hand by a horse, which had bitten another horse.

Result and Time of Attack.—Recovery.

Treatment.—Genista powder. On the seventh day Dr. Marrochetti cauterised the vesicles under the tongue.

Remarks.—Marrochetti believed that these vesicles always appear. This view seems to be of Greek origin, for Dr. Zanthos in *Hufeland's Journal* has shown that they were known long before Marrochetti's time, under the name of Lyssais.

Reference.—*Lancet*, vol. ix. p. 487.

CASE LIX.—Three males, bitten by a rabid dog.

Result and Time of Attack.—No bad result.

Treatment.—Genista powder.

Reference.—*Lancet*, vol. ix. p. 487.

CASE LX.— ——, female, æt. 13, bitten on the face, jaw, and left ala of the nose by a rabid dog.

Result and Time of Attack.—Next day. Fatal on the twenty-eighth day.

Remarks.—The brother of this girl was also bitten on the hand. Sublingual pustules appeared on him, which were cauterised. He recovered.

Reference.—*Lancet*, vol. ix. p. 487.

CASE LXI.— ——, labourer, æt. 55, bitten on the side of the left thigh by a rabid dog.

Result and Time of Attack.—On the sixth day pustules appeared under the tongue, which were cut off and cauterised.

Remarks.—From these and similar cases, Dr. Marrochetti infers that rabies is a local malady, the development of which may be prevented by destroying the vesicles under the tongue. He thinks the hydrophobic virus after remaining some time in the

wound fixes itself at the orifices of the ducts of the sub-maxillary glands on the sides of the frænum, that a peculiar inflammation develops, producing these little pustules. This patient was discharged from hospital shortly after in perfect health.

Reference.—*Lancet*, vol. ix. p. 486.

Case LXII.— ——, male, æt. 60, bitten by a dog supposed to be mad.

Result and Time of Attack.—The wound was cauterised at the time.

Treatment.—On the ninth day on each side of the frænum was seen a semi-transparent vesicle, which was cauterised.

Remarks.—This patient had no subsequent bad symptoms.

Case LXIII.— ——, male, bitten on the fingers by a pug dog.

Result and Time of Attack.—Three months after. Fatal in fifty-seven hours.

Treatment.—Bleeding, injections of assafœtida and belladonna, leeches to epigastrium, blisters between the shoulders, seven-grain doses of lead.

Post-mortem.—The body was examined five hours after death. The brain was healthy in every respect. The œsophagus was quite natural, so was the larynx, and the trachea contained nothing unusual save a quantity of mucus, which had accumulated at the bifurcation ; the lungs were dark, doughy to the feel, they adhered firmly by old connections, and there was no fluid in the pleural cavities. The heart and large vessels were healthy. The liver was soft and of a deep green colour, and the gall-bladder full of healthy bile. The stomach was large and relaxed, full of a greenish-brown fluid, and showing several distended blood-vessels. The intestines, kidneys, and spleen healthy, if we except a patch of cartilage on the convex surface of the last organ.

Reference.—Dr. Bright's Reports, vol xxxi. p. 353, and *Med. Chir. Review.*

Case LXIV.—Henry Baylis, æt. 31, bitten by a dog on the fourth finger of the left hand.

Result and Time of Attack.—Two months after. Fatal.

Treatment.—Calomel, belladonna, Prussic acid.

Post-mortem.—Forty-seven hours after death. Head.—The sinuses were loaded with blood, the tunica arachnoidea thickened and opaque, the pia mater greatly congested, the sections of the cerebrum presented numerous bloody points. The lateral ventricles contained about a drachm and a half of serum. The plexus choroides were gorged with blood. There were about six drachms of serum at the base of the brain. The mucous membrane of the fauces, epiglottis, larynx, trachea, bronchi, very vascular, and the air passages filled with bloody froth. The right lung remarkably red, the left as dark as the colour of venous blood.

Remarks.—The pericardium had its two surfaces intimately united by old adhesions, which had become organised, so that practically speaking he had no pericardium. Nothing remarkable in other parts of the body.

Reference.—Lancet, p. 13. 1844. Mr. Bateman.

Case LXV.—George S., bitten on the thumb by a dog.

Result and Time of Attack.—Fourteen days after. Recovery.

Treatment.—Twenty grains of calomel, salivation.

Reference.—Lancet, p. 668. 1847. Mr. Haines.

Case LXVI.—Ram Jam, male, æt. 12, bitten on the ankle by a rabid dog.

Result and Time of Attack.—A year after. Fatal.

Treatment.—Ether inhalation, injection of turpentine.

Post-mortem.—Eleven hours after death. The pia mater, tunica arachnoidea, brain, and cerebellum very vascular, a great increase of clear serum in the ventricles as well as in the brain, and within the spinal sheath. The mucous coat of the trachea was more injected than natural. Lungs highly engorged, and the mucous coat of the stomach inflamed.

Reference.—Lancet, p. 409. 1847. Staff-Surgeon Robert Allen.

Case LXVII.—John L., bitten by a cat in the leg.

Result and Time of Attack.—Wound cauterised at the time by a hot iron. Eleven years after. Recovery.

Treatment.—Indian hemp, morphia, chloroform.

Reference.—Lancet, p. 122. 1848.

Case LXVIII.— ——, female, æt. 40, bitten on her finger by a greyhound.

Result and Time of Attack.—One month after. Fatal, in four days.

No *post-mortem.*

Reference.—Med. Chir. Review, vol. vii. p. 236. M. Leveille, Royal Acad. Med., Paris.

Case LXIX.—Courmontague, male, æt. 20, bitten by a mad dog on the thigh when a youth of 14.

Remarks.—From this period until he came under the care of Larrey, Courmontague did not cease to experience a kind of nervous affection, which was characterised by spasms and a slight aberration of the intellectual faculties. He was irritable, very loquacious, and was frequently agitated by automatic movements. He was emaciated, his eyes were haggard; he was often afflicted with vertigo and dimness of sight, and he felt an invincible repugnance at the sight of any liquid, even in circumstances in which his companions, oppressed by heat, were compelled to drink in his presence. He drank bitter ptisans and other coloured liquids with more or less avidity. These were his principal symptoms when he came under the management of Larrey—not

on their account, but for a sprain of the right foot, which he had received during a violent exertion. To this affection was soon superadded symptoms of nostalgia, and Courmontague expressed a strong desire to be dismissed the service. Obstinately bent upon this purpose, far from allowing his cure to proceed, he secretly employed means to swell the leg, and to aggravate the disease, so that, in a short time, gangrene appeared in the inside of the foot, and spread so hastily that the whole limb became sphacelated, and was amputated. After some attacks of traumatic irritation, caused by deviations from the prescribed *régimes*, two-thirds of the wound had cicatrised, when, on the 36th day after the operation, the patient suddenly refused all kinds of transparent liquids, and became attacked with signs of cerebral inflammation. He was convulsed ; he locked his jaws, he ground his teeth, and fell into a state of tetanic contraction. All the excretions were suppressed, the spasm and rigidity increased, and during the night of the 33rd he expired. On inspection were found hypertrophy of the cranium, principally in the occipital region, considerable engorgements of the vessels both of the membranes and brain of the superior longitudinal sinus and plexus choroides ; slight granulations on the surface of the hemisphere; about an ounce of yellow serum in the lateral ventricles ; firmness and density of the whole brain, of the spinal cord, and especially of the tuber annulare, in the substance of which a red tinge was evidently manifest, and the neurilemma of the spinal nerves was stained of the same colour. The mucous membranes were all healthy. Except a few old adhesions, nothing morbid could be detected in the lungs, and all the viscera of the abdomen presented a natural appearance. The pericardium was firmly attached to the heart in its whole extent, but evidently by cohesions of a former date ; the cavities were very contracted, and the great vessels which issued from it were not more than two-thirds of their ordinary size.

Reference.—Med. Chir. Review, vol. xxix. p. 2. 1841. Baron Larrey.

Case LXX.— ——, male, æt. 14, bitten in the leg by a dog. Recovery.

Result and Time of Attack.—A week after. Admitted into Guy's Hospital with decided tetanus.

Treatment. This case was recognised as one of tetanus from the outset, and treated as such by calomel and opium, a blister applied to the wound, leeches to the spine, sulphate of zinc. This case illustrates how a bite may produce tetanus ; and hence, should act as a warning to bear this fact in mind.

Reference.—Med. Chir. Review, vol. xxxi. 1832. Dr. Bright's reports.

Case LXXI.— ——, male, æt. 17, bitten on the left hand by

a strange dog ; death took place in forty-eight hours after he was taken in.

Result and Time of Attack.—Two months after. Amputation of the bitten limb was proposed, and the left arm was removed above the elbow.

Post-mortem.—There was no disease worth noticing in either the membrane, brain, or spinal cord. The membranous lining of the trachea, particularly about the bifurcation, was vascular, and the lungs emphysematous.

Reference.—*Med. Chir. Review*, vol. xxxi. p. 350. 1832. This case was recorded in No. 192, *Lancet.*

CASE LXXII.— ——, male, æt. 52, bitten on the upper lip by a dog.

Result and Time of Attack.—Five weeks after. Fatal, in forty-eight hours.

Treatment.—Bleeding, 76 ounces.

Post-mortem.—The blood was found remarkably fluid.

Reference.—*Med. Chir. Review*, vol. xxxi. p. 350. Dr. Bright.

CASE LXXIII.— ——, male, bitten by a small dog.

Result and Time of Attack.—Four months after. Fatal, in less than forty-eight hours.

Treatment.—Two pints of blood were removed from his arm in two bleedings, and then he was placed under the influence of Prussic acid in ten-drop doses every two hours, with two grains of opium and five of calomel in the intervals.

Post-mortem.—The blood was found remarkably fluid. A little water lay both above and beneath the arachnoid, the pia mater was rather too vascular ; there were two bony concretions on the falx, the cerebral substance was firm and rather vascular ; the ventricles were unusually dry. Between three and four drachms of serum lay in the spinal sheath, but the cord was healthy; the lungs were very much gorged with coagulated blood. A little bloody mucus lay in the pharynx, the posterior surface of which presented a purple flush; the trachea was of a deep chocolate colour throughout its whole ramifications ; the lining of the œsophagus was healthy, if we except a reddish-purple appearance near its termination in the stomach, which presented internally a few star-like bloody spots towards the cardiac, and a greenish-purple stain at the pyloric end.

Reference.—*Med. Chir. Review*, vol. xxxi. p. 351. Dr. Bright.

CASE LXXIV.—Frederick L., male, æt. 6, bitten on the second finger of the left hand by a dog which had already bitten several other children.

Result and Time of Attack.—Three months. Fatal, third day.

Treatment.—A few of the dog's hairs had been cut off to place upon the wound, which in eight days was completely healed The treatment consisted in taking twelve ounces of blood from

the arm, scarifying, and applying cantharides ointment to the cicatrix, rubbing in a scruple of mercurial ointment into the inner surface of the left arm. Dr. Horn also visited the boy, and described his features as expressive of extreme anxiety, while his eyes told a tale of immeasurable misery. He implored that he might not be touched or bled again, as he desired nothing more than to be allowed perfect rest. The hydrophobic symptoms persisted until death put an end to his sufferings.

Post-mortem.—A *post-mortem* was made on the 4th Sept., 1820, twenty-five hours after death, in the presence of the late Dr. Heim and several other medical men, by the Medical Officer of Health for Berlin, Dr. Mertzdorf. It has been lately proposed that Medical Officers of Health in England should discharge this duty, which it seems, fifty-seven years ago, was the practice in other countries. In spite of the low temperature of the atmosphere, the smell of putrefaction was already developed. The muscles presented a dark-red appearance, the lungs were charged with blood; the larynx, the trachea, and œsophagus presented nothing abnormal; the tissues of these parts were pale. The redness of the heart was remarkable, the arteries and veins on its surface looking as if they had been injected. The mitral and aortic valves presented a scarlet hue, the trabeculæ carneæ were darker than usual, the internal surface of the aorta was of a bright red hue as far as the arch; the blood contained in the vessels was dark and fluid; the inner surface of the stomach was as pale as that of the œsophagus. No morbid change was found in any other abdominal organ. At the urgent request of the parents the head was not examined.

Remarks.—Twenty-eight days after the injury he complained of pain in his little finger, which the day after involved the hand. On the 2nd of Sept., 1820, pains in the entire left arm and ear supervened; a current of air produced by the mere elevation of the bedclothes, sprinkling a few drops of urine on the skin, excited the same paroxysms as the effects of drinking. Consciousness was unimpaired. He gave sensible answers to the questions put to him, and often expressed that he would willingly die if he could but first drink his fill. Dr. Romberg saw the boy at five in the afternoon. He was lying on his back, his eyes were brilliant and rolled about, his face red, and his features expressed distressing anxiety. His tongue had a very white coating. The skin was dry, the back and the extremities cool, the pulse full (160 beats in the minute), the impulse of the heart strong. The respiration accelerated in proportion to the pulse, the urine of a pale yellow colour. The movements were performed with energy and haste. The mere aspect of a saucer of beer startled the boy, and as soon as the cup approached his lips, sobbing respiration and a convulsive movement of the entire body ensued. He seized

the cup with a trembling hand, and carried it to his mouth and shuddered, and swallowed about half a teaspoonful hastily, but with extreme difficulty. A basin of water was put by the bedside, but he remained quiet on seeing it, and washed his hands without exhibiting any change in his features or in his demeanour. Bright objects, as a mirror, or the polished surface of a watch, did not affect him. The sound of rain, when the window was open, produced no impression, but flies upon his face and hands or the bed annoyed him. His intellectual powers were unimpaired, and he denied that he suffered pain.

Reference.—Romberg, "Nervous Diseases," vol. ii. p. 141.

Case LXXV.— — Menard, male. bitten by a dog.

Result and Time of Attack.—Fatal.

Treatment.—Bleeding, injection of warm water into the left radial vein.

Remarks.—This boy was in imminent danger of suffocation, having thrust a piece of cloth into his mouth in one of his hydrophobic paroxysms. M. Caillard, resident physician of the Hôtel Dieu, boldly put his hand into what most men would think an awkward situation, and reserved him for equally certain but more tedious destruction. The boy inflicted a deep bite on M. Caillard's right hand, the wound was immediately cauterised by the hot iron. M. Caillard had been previously bitten by another hydrophobic patient on the finger without experiencing any bad consequences, and in fact seemed to pay no regard to the wounds inflicted by the rabid of his own species upon him. Another circumstance is mentioned in connection with this case which we cannot pass without remark, as a warning to amateurs who may be tempted to indulge in experiments. An amateur of experiments had inoculated ten dogs with the hydrophobic virus, and having made them as bad as could be wished, became naturally desirous of getting rid of them. Now most men would have despatched such animals as speedily and as securely as possible, but this philosopher ties them up loosely in a bag and commissions a poor wretch to throw them into the Seine ; the man, little dreaming what a cargo he was carrying, stops at an auberge to take some wine, and eases himself for a minute of his load. The dogs escape from the sack, and the experiment is concluded by sixty-four persons being cauterised at the Hôtel Dieu for wounds inflicted by the same dogs, and by ten dying in that institution of hydrophobia.

Case LXXVI.—Charles Mignot, bitten on the arm by a wolf, not known whether mad. Wound not cauterised.

Result and Time of Attack.—Six weeks after. Fatal, in eleven days.

Treatment.—Bleeding, salivation, baths.

No *post-mortem.*

Remarks.—"We are disposed in this case to doubt the existence of real rabies canina."—Ed. *M. C. Review.*

Reference.—Med. Chir. Review, vol. ii. p. 499. 1825. Recamier.

Case LXXVII.—Madame M., æt. 46, bitten on the lip by her lap-dog, which was rabid. Wound not cauterised for some days.

Result and Time of Attack.—Five days after. Recovery.

Treatment.—Baths, salivation, calomel.

Remarks.—"This is another doubtful case, the symptoms being such as might be expected from fright working on the imagination of a nervous hypochondriacal female."—Ed. *M. C. Review.*

Reference.—Med. Chir. Review, vol. ii. p. 499.

Case LXXVIII.—Dom. Brizzi, bitten by his own dog. Wound cauterised.

Result and Time of Attack.—Six days after symptoms appeared. Recovery.

Remarks.—The dog bit master, son, and servant; the servant's wound was not cauterised, and he died of hydrophobia in the course of two or three days.

Reference.—Med. Chir. Review, vol. iii. p. 299, *Storia Medica di un Caso Raro.* Dr. L. Emiliani.

Case LXXIX.— ——, male, bitten on wrist and hand. Wound excised. He was desirous of having the arm amputated. He was able to swallow liquids almost to the last.

Result and Time of Attack.—Eleven months afterwards. Fatal in three days.

Treatment.—Opium, colchicum.

Post-mortem.—A most minute and faithful account given of autopsy, part of which we copy:—The dura mater was preternaturally vascular, the arachnoid opaque, and the pia mater presented a complete mass of highly injected bloodvessels. The medullary structure of the brain showed a number of bloody points, the theca vertebralis was vascular. Neck and arm: The par vagum manifested a general blush of inflammation, the sheath of the nerve injected with bloodvessels, and small vessels were observed running parallel. The fourth, fifth, sixth, and seventh cervical nerves highly injected, and some of them were so much altered in character as to resemble muscular fibres; their external surface was almost scarlet, while the internal was of a pink colour. The branches of the cutaneous nerves leading up from the cicatrix, which was vascular, and had been painful, presented the same appearance. The lining membrane of the mouth inflamed. The larynx, pharynx, trachea, fauces, uvula inflamed. The œsophagus, especially near the cardia, was very vascular, the lungs congested. Some patches of inflammation were seen on the surface of the stomach. The intestines were natural, the other viscera natural. Spine: The theca vertebralis was covered with injected

bloodvessels. The medulla spinalis was natural, but evident appearances of inflammation were visible at the origin of all the cervical nerves in it. The pelvic nerves did not present the appearances found in the other nerves. The autopsy was made by Mr. Bickersteth and Mr. Hatton, and lasted six hours.

Reference.—Med. Chir. Review, vol. iii. p. 534. 1825. Dr. Bickersteth.

Case LXXX.— ——, male, bitten by a mad dog in Nov., 1823.

Result and Time of Attack.—Eleven months afterwards. Fatal, in twenty-four hours after the first symptoms appeared.

Post-mortem.—The vessels of the brain injected, sinuses filled with blood. There was half an ounce of serous effusion in the ventricles. Perforation of the stomach capable of admitting the closed hand, from which a clear coloured fluid had escaped into the abdomen. The pericardium was highly vascular, the whole pharynx inflamed, and the back of the throat was covered with bloody frothy mucus. The lower part of the œsophagus was deprived of its mucous membrane.

Treatment.—Injection of morphia and warm water into the veins after the system recommended by Mr. Booth, of Birmingham, and practised by Magendie "on a case now allowed not to have been hydrophobia at all, but a spontaneous disease resembling rabies canina."—Ed. *M. C. R.*

Reference.—Med. Chir. Review, vol. iii. pp. 571—575. Dr. Brandreth.

Case LXXXI.— ——, boy, æt. 14, bitten by a dog, state unknown. Wound cauterised with red-hot iron; blister kept on the parts.

Result and Time of Attack.—Seven weeks after. Fatal.

Treatment.—Injection of vinegar per rectum, and also given by the mouth.

Reference.—Med. Chir. Review, vol. iv. p. 264. 1826.

Case LXXXII.—James Hacket, bitten by a cat on leg and thumb.

Result and Time of Attack.—Seven weeks after. Fatal, in twenty-seven hours.

Treatment.—Calomel.

Reference.—Dublin Medical Press, p. 350. 1840. Mr. Duigan.

Case LXXXIII.—Catherine King, æt. 18. There is no direct history of the bite, but it was supposed she had been bitten ten years previously. Mr. Macintire examined the left arm and hand in which she had pain, and on the third finger found a small cicatrix, the edges of which were inflamed.

Result and Time of Attack.—Fatal, second day.

Treatment.—Opium assafœtida, enemas, baths.

Remarks.—Mr. Macintire asks some very perplexing questions. He says, "There was a family quarrel in the house by which she

was much excited. Could the attack have been produced by this excitement acting on a constitution predisposed to hydrophobia? There are well authenticated cases of the virus of a rabid animal remaining dormant a number of months after the wound had been inflicted, but only one that I am aware of at all approaching to the length of time mentioned here. Can the virus remain dormant till roused by some exciting cause?"

Reference.—Dublin Medical Press, p. 307. 1842.

CASE LXXXIV.—James McLellan, æt. 40, bitten on the fingers by a dog which he tried to save from drowning; he became a victim to his humanity.

Result and Time of Attack.—Five months after. Fatal, second day.

Treatment. Prussic acid, Indian hemp.

Post-mortem.—Brain and spinal cord normal, general congestion of lungs and mucous membrane of the trachea.

Remarks.—In the course of eight or nine days, his wounds were quite well, and he felt no inconvenience from them afterwards, and did not believe that his illness had any connection with them.

Reference.—Dublin Medical Press, p. 230. 1843. Dr. Carson.

CASE LXXXV.—Andrew Woods, æt. 4, bitten by a dog supposed rabid, the bite completely removed the ala nasi, injured the right cheek, and extended across the nose down to the left cheek.

Result and Time of Attack.—Sixteen days after. Fatal, fourth day.

Remarks.—The wound was ragged and lacerated, presenting a very frightful appearance; it was pencilled with a strong solution of lunar caustic and sutured, and when the suture was removed the wound looked well.

Reference.—Dublin Medical Press, p. 408. 1844. Dr. Lynn.

CASE LXXXVI.—— Phelps, police officer, bitten on the upper lip and nose by a pointer, which was never heard of afterwards.

Result and Time of Attack.—Seven weeks after. Fatal.

Remarks.—This patient was attended by Drs. Williams, Percy, Attenburrow, Sibson, and Mr. Davison, who put in practice all the resources of medicine, but in vain. An express was sent off to Waterton, to come and try the wourali poison, but when he reached Nottingham with Sir Arnold Knight, the unfortunate police officer was dead. Professor Sewell has the merit of suggesting this poison, in cases of hydrophobia, and so certain was he of a favourable result, that Waterton states that he heard him declare before Sir Joseph Banks and a large company of scientific men that he would not hesitate one moment in having the wourali poison applied to himself if he had hydrophobia, as he felt confi-

dent that the application of it would prove successful. Waterton has described in his "Wanderings" the poison, and its mode of preparation; his ass, Wouralia, lived four-and-twenty years at Walton Hall, after being resuscitated from its effects. Waterton, on account of his eccentricities and his wonderful adventures, has been unjustly classed amongst the Munchausen family, but modern discoveries tend to do justice to his memory, and his "nondescript" is not now looked upon as such an impossible creature. The experiments at Nottingham by Dr. Sibson and Waterton, at the medical school, are interesting at the present time, when we compare them with the cases of hydrophobia from which a recovery took place, after the use of curara. Two asses were poisoned, and both restored by the process of artificial respiration. Dr. Sibson kept it up for seven hours before the animal exhibited the least symptoms of returning motion, and that was first observed in a momentary quiver of the eye-lid. The ass died on the third day, but its death might be attributed to other circumstances. The second ass recovered, and lived for years. Waterton tells us that every person present seemed convinced that the poison was under the control of the operator, and that by artificial means its malignant qualities could be subdued, and that it could be applied to human beings suffering from hydrophobia. Dr. Sibson had improved the bellows so as to render the process of inflation less laborious, and he had some of the poison brought from the forests of Guiana in 1812 by Waterton, and there was also a supply of it, as pure and as potent as it was on the day first procured, in the possession of Waterton himself. When we have to deal with treatment, we shall have to enter more fully into this subject, for there are many points yet to be settled before, on the evidence of two cases, we can assert the fact that the remedy is found. The *Times*, in its issue of October 31st, 1877, has devoted a leader to the Offenberg case, but in justice to both Professor Sewell, Waterton, and Dr. Sibson, and the profession in England, we must acknowledge their prior claims to the suggestion of this remedy.

Reference.—"Autobiography of Charles Waterton," p. 14, ed. 1844.

CASE LXXXVII.— ——, male, æt. 48.

Remarks.—He had never been bitten by any animal, yet he suffered from horror of fluids, delirium, convulsions, etc. He died on the fifth day from the first symptom.*

Post-mortem.—The cerebellum was as soft as jelly, the annular protuberances and rachidian bulbs also softened, and the membranes of the brain slightly injected.

Reference.—Dr. Holland and Dr. Shinkwin's Lectures.

*Compare Hydrophobie, Suite de Chaleur, par *Laurens.* Journal de Vand, 1757, t. vii. p. 81. Hyd. communiquée par l'atmosphere, par *Lebeau.* J. de V., 1761, t. xi. p. 99.

LXXXVIII.— ——, male.

Remarks.—This young man, in a moment of intense passion, while entreating his former mistress to allow him to renew his intimacy with her, bit himself on the middle finger. Convulsions ensued directly, with horror of water. He died on the fourth day.*

Reference.—Dr. Holland and Dr. Shinkwin's Lectures.

CASE LXXXIX.— ——, female, æt. 21.

Remarks.—Dr. Hirz reported this case. His patient was quickly cured of the itch by red precipitate ointment. Horror of water came on. The author considering it to be caused by the eruption being driven back on the membranes of the cord, blistered the entire of the spine. Calomel, strychnia, and sulphur were administered internally. She recovered in three days. A similar case is recorded by Dr. Jeitelles, the patient being cured of itch by cold baths.

Reference.—Dr. Holland and Dr. Shinkwin's Lectures.

CASE XC.— ——, a boy, æt. 17.

Remarks.—Some cold water was poured on him by his fellow servants while he was sleeping. Convulsions followed, and for three weeks he had slight dread of water, which finally became so prominent a symptom that he was admitted into hospital. He became worse. On obliging him to drink he became convulsed. He died in fifty-four hours after his admission. The autopsy revealed inflammation of the brain and membranes of the entire spinal cord.

Reference.—Dr. Holland and Dr. Shinkwin's Lectures.

CASE XCI.— ——, male.

Remarks.—A confirmed brandy-drinker, who had never been bitten to his friends' or his own knowledge, died with all the symptoms of hydrophobia. Some years before his death after taking an unusual quantity of drink, he had similar symptoms, which passed off in three hours.†

Reference.—Dr. Holland's Notes and Dr. Shinkwin's Lectures.

CASE XCII.— ——, male, a soldier.

Remarks.—This man drank at a draught a pint of gin. Death ensued.

Reference.—Dr. Holland and Dr. Shinkwin's Lectures.

CASE XCIII.— ——, male, æt. 34.

Remarks.—After a furious fit of passion, this patient was seized with feverishness, vomiting, delirium, horror of fluids, and inability to drink. Death soon followed.

* Obs. sur une morsure venimeuse et mortelle d'un canard amoreux, par LE CAT : J. de Vand., 1755, t. ii. p. 90.

† TRIBOLET DE LA LANCE. Diss. de Hydrop. sine morsu prævia : *Bale*, 1765.

Post-mortem.—The membranes of the brain were congested. A thin layer of extravasated blood lay on the dura mater, at the posterior part of the left hemisphere, with many small plastic exudations scattered over the surface of the pia mater. Many bloody points on the cut surface of the brain ; a small amount of bloody serum in the ventricles.*

Reference.—Dr. Holland and Dr. Shinkwin's Lectures.

CASE XCIV.— ——, female.

Remarks.—This is the well-known case of a woman who, during many months of each pregnancy, was so terrified at the sight of water, that she could with difficulty be induced to cross a bridge.†

Reference.—Dr. Holland and Dr. Shinkwin's Lectures.

CASE XCV.— ——, male.

Remarks.—This young man, affected with syphilis, was ordered Plummer's pills, which caused feverishness and pain in the chest. When the mercury was discontinued and the ulcers healed, the pain returned with priapism, horror of liquids, inability to swallow fluids, extreme anxiety caused by currents of air, and convulsions, in one of which he died.

Reference.—Dr. Holland and Dr. Shinkwin's Lectures.

CASE XCVI.—Charles G., male, æt. 10, struck by a boy with a stone on the lip ; also said he was bitten on the leg by a dog.

Result and Time of Attack.—Five days after ; three weeks after dog-bite. Fatal.

Treatment.—Belladonna, opium, chloroform.

Post-mortem.—Autopsy twenty hours after death. The membranes of the brain were congested, and there was fluid in the left ventricle; the spinal cord injected with blood ; serum to the extent of two ounces beneath the theca vertebralis. The tongue was coated with a thick layer of epithelium, and the papillæ numerous and larger than usual : a quantity of saliva was in the mouth, and the fauces were very red. Intestines : various contractions of the small intestines were noticed. Nothing else important.

Remarks.—This was a supposed case of tetanus and hydrophobia combined.

Reference.—*Lancet*, p. 259. 1848. Mr. Hamilton.

CASE XCVII.—F., male, æt. 5, bitten on the right cheek and on the nose by a dog.

Result and Time of Attack.—Five weeks after. Fatal.

* Obs. d'hydrophobie venue apres commotion cerebrale, par Trecourt : Journal de Vander, 1757, t. vi. p. 151.

† Hydrophobie pendant les quatre premiers mois de 11 grossesses, par Magar de Canales : *ut supra*, 1769, t. xxx. p. 152.

Treatment.—Calomel, Prussic acid, blisters, opium.

Post-mortem.—Membranes of the brain very vascular, and general vascularity of the brain substance; increased vascularity of spinal cord and membranes; a considerable quantity of fluid between the membranes and the cord; the pharynx was of a deep, dusky, red colour, and the mucous follicles enlarged; the lungs more vascular than usual.

Reference.—*Lancet*, p. 335. 1849. Dr. Fife, Mr. Paget, Mr. Irons.

CASE XCVIII.— — Heywood, male, æt. 4, bitten on the lip and cheek by a dog. The wound had been touched with caustic as soon as a medical man could be seen.

Result and Time of Attack.—Six weeks after. Fatal on the fourth day.

Treatment.—Sedatives.

Reference.—*Dublin Medical Press*, p. 82. 1854. Dr. Forsyth.

CASE XCIX.—Emma Hallstrom, æt. 8½, bitten on the head by a mastiff.

Result and Time of Attack.—Forty-five days after. Fatal, third day.

Treatment.—Dr. Santesson employed chloroform, as no other plan afforded a prospect of a better result, the effects of it in this disease having been found useful in affording temporary relief.

Reference.—*Dublin Medical Press*, p. 193. 1859. Translation from the Swedish by Dr. Moore.

CASE C.— ——, male, bitten on the leg by a mad dog. The bite was a severe one; the parts much torn; nitrate of silver and the knife were employed at the time; the wound never cicatrised.

Result and Time of Attack. Fourteen months after. Fatal, in twenty-four hours.

Reference.—*Dublin Medical Press*, p. 19. 1861. Dr. Gore.

CASE CI. George Ar, æt. 13, bitten on the upper lip by a dog which was then under treatment for madness, but had got loose in some way. It also bit a little girl.

Result and Time of Attack.—Twenty-nine days after. Fatal, on the second day.

Treatment.—Sedatives, and an attempt was made to administer chloroform.

Post-mortem.—A *post-mortem* was made by Dr. Wilks, but nothing was seen with the exception of redness at the back of the tongue and fauces, and some injection of the larynx and upper part of the trachea. Nothing was seen on a superficial view of the brain and cord, but the pons, medulla oblongata, and spinal cord were placed in the hands of Mr. Durham for microscopical examination.

Remarks.—In reference to the use of chloroform, it was, we believe, first applied by Dr. Hartshorne, in 1848 (*American Medical Journal*, p. 339). Our tables show that it has been used about the same period in England, and there is one case of recovery after its use recorded by Dr. Jackson, but from the evidence we do not consider it an example of rabies.

Reference.—*Dublin Medical Press*, p. 134. 1865.

Case CII.—Dr. Buisson.

How Poisoned.—In attending a female patient in the last state of rabies, the doctor imprudently wiped his hands with a handkerchief impregnated with the saliva. There happened to be a slight abrasion on the index-finger of the left hand, and, confident in his own curative system, the doctor merely rinsed the part with water.

Remarks.—He was fully aware of the imprudence he had committed, and gave the following account of the matter afterwards. "Believing that the malady would not declare itself until the fortieth day, and having numerous patients to visit, I put off the application of my remedy, that is to say, vapour baths. The ninth day, being in my cabinet, I felt all at once a pain in the throat, and a still greater one in the eyes. My body seemed so light, that I felt as if I could jump to a prodigious height, and if I threw myself out of the window I could sustain myself in the air (?). My hair was so sensitive, that I appeared able to count each separately, without looking at it (?). Saliva kept continually forming in the mouth. Any movement of air inflicted great pain on me, and I was obliged to avoid the sight of objects. I had a continual desire to run and bite, not only human beings, but animals, and all that was near me (?). I drank with difficulty, and I remarked that the sight of water disturbed me more than the pain in my throat. I believe that by shutting the eyes any one suffering from hydrophobia can always drink. The fits came on every five minutes, and I then felt the pain start from the index-finger and run up the nerves to the shoulder. In this state, feeling that my course was preservative and not curative, I took a vapour bath, not with the intention of cure, but of suffocating myself. When the bath was at a heat of 52° Centigrade (189°-Fahrenheit) all the symptoms disappeared as if by magic, and since then I have never felt any more of them. I have attended more than eighty persons bitten by mad animals, and I have not lost a single case. When a person has been bitten by a mad dog, he must for several successive days take a vapour bath *à la Russe*, as it is called. This is the preventive remedy. When the disease is declared, it only requires one vapour bath rapidly increased to 63 deg. Centigrade, then slowly to 37 deg. The patient must strictly confine himself to his chamber until the cure is complete."

Reference.—*Salut Public*, Lyons.

Case CIII.—

Remarks.—Mason Good says :—"I have occasionally met with a few obstinate cases of hydrophobia, or water-dread, without any connection with rabies—one especially, in a young lady of 19 years of age, of a highly nervous temperament, which was preceded by a very severe toothache and catarrh. The muscles of the throat had no constriction, except on the approach of liquids, and the patient through the whole of the disease was able to swallow solids without difficulty, but the moment any kind of liquid was brought to her, a strong spastic action took place, and all the muscles about the face were violently convulsed if she attempted to swallow. Similar examples are to be found in Battini, Dumas, Alibert, and several other medical records. Hydrophobia is therefore too general and indefinite a term to characterise the genus before us, unless we mean to include under it diseases which have little connection with rabies. Hunauld has made seven distinct species, of which two only are irremediable, and Swediaur has followed his example."

Reference.—*Study of Medicine*, vol. iv. p. 382. Mason Good.

Case CIV.—Charles J., bitten on the wrist.

Result and Time of Attack.—Six weeks after. Fatal.

Treatment.—Morphia.—chloroform.

Post-mortem.—Thirty-seven hours after death. No unusual vascularity of the pharynx. Considerable adhesion of the dura mater to the calvaria, along the line of the coronal suture, and notable enlargement of the vessels of the dura mater leading up to this situation from behind, especially on the right side. Extreme congestion of the pia mater over the whole surface of the brain. Arachnoid natural in appearance, well-marked flattening of convolution ; no subarachnoid fluid. Universal adhesions of the pia mater and arachnoid to the surface of the convolutions, so that it was impossible to strip off small portions without at the same time tearing away the superficial grey matter. There was also a close adhesion of the minor surfaces of the anterior lobes to one another, attempts to separate them only resulting in a tearing of the grey matter. On section of the brain the vessels were found to be very numerous in the white matter ; and the grey matter was broad, very dark, and quite dusky in colour. There was a slight *post-mortem* maceration of the surfaces of both thalami, and the pharynx was soft and diffluent. No fluid seen in the lateral ventricles ; choroid plexus much congested. The congestion of the medulla was not more marked than that of other parts of the encephalon, and nothing abnormal was detected about the roots of the right nerve. There was a decided increase in the amount of fluid in the spinal canal surrounding the cord. The fluid had a yellowish, transparent, and slightly gelatinous appearance. The cord itself presented no unusual appearance. The

pericardium contained about two fluid drachms of straw-coloured fluid. The right side of the heart, and also the left auricle, contained dark, slightly coagulated blood. The left ventricle was contracted, and contained a small decolorised gelatinous clot, which extended a short way into the aorta; the valves were healthy. Both lungs were congested and gorged with blood, more especially the right; pleuræ natural. The stomach was slightly congested, and presented a few patches of ecchymosis near the pyloric extemity. Liver firmer than normal, somewhat marked in colour owing to the presence of lighter coloured patches here and there. Spleen rather pale, small, and firm. Kidneys—cortical substance wide and unusually pale in colour, capsules easily removed. The intestines appeared quite natural, but were not opened.

Reference.—Lancet, p. 63. 1866. Dr. Simpson, Dr. Bastian.

CASE CV.— ——, male.

Result and Time of Attack.—Seventy-two days after the bite. Fatal.

Remarks.—Patient lived five days after the first symptoms.

Reference.—Lancet, p. 530. 1869. Dr. Moore.

CASE CVI.— ——, male.

Result and Time of Attack.—Sixty-seven days after. Fatal.

Remarks.—Patient lived sixty-three hours.

Reference.—Lancet, p. 461. 1869. Dr. Gilbertson.

CASE CVII.— ——, female, æt. 11, bitten on the face by a dog.

Result and Time of Attack.—One month after. Fatal.

Remarks.—In the same newspaper in which the account of this case is given there are records of the death from hydrophobia of a child who had been bitten six weeks before, and also of a coachman, near Stockport, who died, having been bitten in the middle of June.

Reference.—Lancet, p. 163. 1870.

CASE CVIII.—S. B., male, æt. 37, bitten on the thumb by a rabid dog. Wound cauterised with nitrate of silver.

Result and Time of Attack.—Fatal eighty-six hours after the development of the distinct symptoms.

Treatment.—Hypodermic injection of morphia, chloroform.

Remarks.—In connection with these cases on Jan. 2, 1872, Dr. Clifford Allbutt exhibited a series of microscopic sections from the cerebro-spinal centres before the Pathological Society of London. We shall in our remarks on the pathology and morbid anatomy give his observations in full, as we consider them of the utmost importance.

Reference.—Lancet, p. 537. 1871. Mr. A. F. McGill.

CASE CIX.—Emma E., æt. 13, bitten by a dog supposed to be rabid.

Result and Time of Attack.—Six weeks after. Fatal in forty-six hours after appearance of first symptoms.

Treatment.—Hypodermic injection of morphia, injections of ammonia.

Reference.—Lancet, p. 537. 1871. Mr. A. F. McGill.

Case CX.— ——, female, æt. 40, bitten by a dog.

Result and Time of Attack.—Fatal.

Treatment.—Four injections of curara hypodermically; six and a half grains altogether. Tracheotomy.

Reference.—Lancet, p. 227. 1872. Professor Paccanti, Pisa.

Case CXI.—Joseph A., bitten on the wrist by a dog seemingly healthy.

Result and Time of Attack.—Six weeks after. Fatal, first day.

Post-mortem.—Membranes of brain highly congested, arachnoid and pia mater presented a pink appearance throughout, veins much distended, no fluid in the lateral ventricles, but numerous bloody points on making section of brain. External appearance of spinal sheath congested, arachnoid and pia mater congested the whole length of cord, spinal cord congested in cervical region, left and right lungs congested, stomach and bowels congested. There were no signs of swelling or inflammation in the wrist.

Reference.—Lancet, p. 513. 1874. Drs. Muscroft, Skinner, Grabham, Sims, and Kemp.

Case CXII.—William W., male, æt. 32, scratched on the knuckle by a small healthy puppy, three months old.

Result and Time of Attack.—Six months after. Fatal, third day.

Treatment.—Belladonna, bromide of potassium, atropine.

No *post-mortem.*

Reference.—Lancet, p. 514. 1874. Dr. Muscroft, Dr. Ginders.

Case CXIII.—Patrick, C., æt. 10, bitten by a young retriever dog.

Result and Time of Attack.—Five months after. Fatal.

Treatment.—Subcutaneous injection of morphia.

Post-mortem.—Nineteen hours after death. Congestion of the veins of the dura mater. The sinuses were filled with clots of blood. The pia mater was greatly congested, and its surface covered with a thin layer of recently-formed lymph. The vessels of the brain itself were greatly congested, and the ventricles contained more fluid than usual. On removal of the spine the whole canal was found very much congested, as also was the spinal cord There was an increased quantity of fluid present, but no sign of any injury. The lungs were congested. Nothing else of any importance.

Reference.—Lancet, p. 664. 1874. Sunderland Infirmary.

Case CXIV.—J. C., bitten in the hand by the same dog.

Result and Time of Attack.—Fatal.

Treatment.—Hydrate of chloral, chloroform.

Post-mortem not given.

Reference.—*Lancet.* 1874. Sunderland Infirmary.

CASE CXV.—George ——, æt. 37, bitten on the thumb of the left hand.

Result and Time of Attack.—Fatal.

Treatment.—Chloral hydrate, injections of morphia, vapour bath.

No *post-mortem.*.

Reference.—*Lancet*, p. 823. 1874. Mr. Garnham.

CASE CXVI.—Mrs. M., æt. 55, bitten on the upper lip and on the face.

Result and Time of Attack.—Sixteen days after. Fatal.

Treatment.—Chloroform, morphia, chloral.

No *post-mortem.*

Reference.—*Lancet*, p. 366. 1874.

CASE CXVII.—D. C., male, bitten on the hand by a wild dog.

Result and Time of Attack.—Six weeks afterwards. Fatal.

Remarks.—There was not the slightest reason to suppose the dog had been bitten by his tame congeners, and there were no symptoms of rabies in the dog.

Reference.—*Lancet*, p. 655. 1874. Surg.-General McClean.

CASE CXVIII.— ——, child, æt. 10, bitten above the ankle.

Result and Time of Attack.—Forty days after.

No *post-mortem.*

Reference.—*Lancet*, p. 645. 1874. Surg.-General McClean.

CASE CXIX.—Henry W., æt. 12, bitten on the right little finger by a dog.

Result and Time of Attack.—Six weeks after. Fatal, third day.

Treatment.—Calomel, belladonna, chloroform, enemas of bromide of potassium, and chloral hydrate.

Post-mortem.—Fifty hours after death, body much decomposed. Results mostly negative, brain congested. On section, the grey matter, both external and internal, was unusually distinct and congested, numerous vessels in the white substance. Internal organs congested, tongue congested.

Reference.—*Lancet*, p. 589. 1875. St. Thomas's Hospital. Mr. Jones.

CASE CXX.—M. H. K., male, æt. 13, bitten on the upper lip and left shoulder. Wound cauterised.

Result and Time of Attack.—Twenty days after. Fatal, third day.

Treatment.—Chloroform.

Post-mortem.—Forty-eight hours after death. General congestion of brain and membranes. The grey substance resembled

very much the colour of muscle; this was particularly evident on section of the corpus striatum and optic thalami. The divided vessels were extremely prominent in the white substance of the brain. On examining the spine there was found considerable congestion of the vessels ramifying in the cellular tissue beneath the arches of the vertebræ, especially in the cervical region, and about the position of the fifth cervical spine was a gelatinous mass, extending upwards and downwards, lying between the dura mater and the arches of the spinal canal.

Reference.—Lancet, vol. ii. p. 85. 1876. Hertford Infirmary.

Case CXXI.—Edward T., æt. 30, bitten on the back of the left hand.

Result and Time of Attack.—Nine months after. Fatal, second day.

Post-mortem examination showed congestion of most of the organs, but perfect absence of organic change. The brain and cord were reserved for more minute examination. This patient was seized with an attack of spasm of the glottis, artificial respiration, electricity, and laryngotomy were resorted to.

Reference.—Lancet, vol. ii. p. 682. 1876. Royal Free Hospital.

Case CXXII.—W. Murgatroyd, mill hand, male, æt. 17, bitten on the hand by a cat. The owner of the cat, as soon as he was informed of the accident, though he did not notice there was anything wrong with it, killed the cat, and gave as his reason that he would not keep a cat that would bite any one. There had been several mad dogs during the summer and autumn at Walsden, but he did not know whether the cat had been bitten by any dog or animal.

Result and Time of Attack.—Nearly four months after. Fatal, second day.

Remarks.—Dr. Gustavus Le Lacheur deposed on oath:—I am a surgeon at Walsden. I first saw deceased on Sunday, January 16th, about 11 a.m., he was in bed in a very excited condition; his breathing very jerky; complained of slight pain and stiffness in left arm, and had considerable difficulty in swallowing. I gave him a sedative, and ordered cold applications to the spine, and ordered him to be watched during the night. His relatives informed me that he had been bitten by a cat in September, and that he had been very peculiar in his manner for the last two days. I next saw him about 10 a.m. on Monday, and found all the symptoms of hydrophobia. I had to have him strapped to the bed on account of his violence and of his attempts to bite those in attendance. At intervals he was perfectly sensible. He foamed at the mouth, and was unable to swallow. If liquids were offered he became convulsed. There is not the slightest doubt that the cause of death was hydrophobia.

Reference.—The above notes were obtained by the courtesy of the coroner, William Barstow, Esq. Inquest held at Walsden, Jan. 7, 1876.

CASE CXXIII.—Elizabeth Dobell, æt. 24, bitten by a Pomeranian dog, two years old, on the fleshy part of the thumb, whilst she was carrying it. The dog showed signs of rabies, and was poisoned. The wound was washed and cauterised on the same day, and it healed in ten days.

Result and Time of Attack.—Six weeks after. Fatal, third day.

Remarks.—Arthur Rayner, F.R.C.P., deposed :—On the 21st of October, 1877, I was called to see deceased, and found her in a highly nervous state. I was told she had been bitten by a dog. Next day she could not swallow, and I called in Dr. Marshall, of Savile Row. The case then assumed a serious aspect. There was a mark of a wound on the right thumb, no trace of inflammation. She complained of pins and needles. On the Wednesday she appeared better. She was fed by injections. On Thursday she was in strong convulsions, and she objected to any one breathing in her face. On Friday, about 2 a.m., I was called, and found her dying, and at 2.30 she died.

Post-mortem.—Head. Membranes congested, gorged with black blood, ventricles contained serum and fibrous lymph ; lungs gorged with blood ; heart slightly fatty ; right cavity contained black tarry blood ; liver healthy ; stomach congested ; larynx, trachea, and mucous membrane congested.

Reference.—Notes obtained by the courtesy of Dr. Hardwicke, coroner for Middlesex.

CASE CXXIV.—James Hickey, æt. 18, bandsman in the 55th Regiment. He was playing with his cat when it scratched the back of his hand ; the cat was supposed to have been bitten by a mad dog.

Result and Time of Attack.—He was shortly afterwards taken ill, and was removed to Haslar Hospital, where he died.

Reference.—Daily News, November 3rd, 1877.

CASE CXXV.—John Rigby, æt. 40. A dog sprang at him and bit him on the nose. He was playing with it a short time previously.

Remarks.—Rigby continued at his work up to about 29th October, 1877, when alarming symptoms set in. He died soon after. The jury returned a verdict of " Death from hydrophobia caused through the bite of a dog."

Reference.—Daily News, November 3rd, 1877.

CASE CXXVI.—Francis H., æt. 39, bitten on the hand by a dog. Wound cauterised with nitrate of silver ; had healed up, but had broken out again about eight or nine days before he was taken ill.

Result and Time of Attack.—Two months after. Fatal.

Treatment.—Bromide of potassium. chloroform. The head shaved, blister applied to back of head and nape of neck.

Post-mortem.—Heart rather contracted, normal in structure; old adhesions of pleura; right lung dark-red on section; crepitant everywhere except at margins, where there was a little emphysema. On pressure a dark-red frothy fluid exuded; left lung crepitant, dry, and emphysematous at margin; stomach congested in the greater part of its extent; brain weighed fifty ounces; vessels of the pia mater somewhat injected; a very little sub-arachnoid dropsy at posterior part; aspect of brain tissue and brain structure quite normal to the eye; spinal cord quite normal everywhere.

Reference.—*Lancet*, p. 82. 1877. Dr. Dunlop, Glasgow.

Case CXXVII.—William Ray, æt. 56, bitten on the thumb and finger by a dog.

Result and Time of Attack.—Three months after. Fatal.

Treatment.—Atropine, morphia.

Remarks.—This case gave rise to some censure, as Dr. M——, for the sake of experiment, took a basin containing water behind the door and allowed it to fall with a splash, which alarmed the man very much. This patient had read the report of the previous case, and was very much alarmed by it, especially as his companions at work chaffed him about going mad. There was no *post-mortem*. Dr. Charteris seems to approve of Trousseau's maxim, to which we shall again allude. The first case was also severely animadverted on, as a dog was accidentally admitted into the ward.

Reference.—*Lancet*, p. 123. 1877. Dr. Charteris, Glasgow.

Case CXXVIII.—John M'G——, æt. 31, bitten on the hand by a dog; wound washed with carbolic acid. This patient was very much afraid of contracting hydrophobia.

Result and Time of Attack.—A month after. Fatal.

Treatment.—Chloroform.

Remarks.—The report of the autopsy says every organ in the body was healthy. The brain and its membranes were slightly congested, which may have been the effect rather than the cause of the disease. We may safely say the Glasgow cases, either as records or for treatment, do not reflect much credit on the profession.

Reference.—*Lancet*, p. 161. 1877. Dr. Patterson, Glasgow.

Mr. Fleming (*Lancet*, Feb. 3rd, 1877) says, "I heartily endorse the remarks made by Mr. Richardson with regard to the treatment the unfortunate man suffering from hydrophobia received at the Glasgow Royal Infirmary. When I read the case in the *Lancet* I could scarcely believe it possible such torture could be inflicted, and without the slightest object to be gained, unless it

were the satisfying of a most abnormal curiosity. The admission of a dog to the ward of a patient labouring under this much-dreaded of all diseases, sprinkling water in his face, breathing upon and fanning him with a towel, blowing upon his neck and face, must surely be designated as nothing less than extreme cruelty, and certain to destroy the only chance of recovery the poor man may have had."

Case CXXIX.— —— (Communicated by Surgeon-General C. R. Francis, M.B., Sutton, Surrey, Nov., 1877). Some years ago the child of a well-known medical officer in India was scratched on one side of her hand with a pin. Before the wound had healed a favourite little dog—a house pet—licked it. Within a month the child became ill with hydrophobia, and died. Shortly afterwards the dog, who up to that time had appeared quite well, also showed symptoms of the disease; and soon succumbed to it. Dr. Prall, of West Malling, in Kent, recently recorded in the *Times* a case where a youth who, having not long before been bitten by an apparently healthy dog, died with nervous symptoms resembling those which characterise hydrophobia. Unwisely, I think, this dog has since been destroyed. Doubtless, rabies would have displayed itself; but it would have been important to note the interval between the date of the bite and this development of the disease. The case of the child in India affords another illustration of a fact now well known, viz., that a bite is not needed to produce rabies. Enough, if the animal's saliva comes in contact with an abrasion. But, that the disease should be developed in the human subject, after salivary contact with an animal in whom the malady had not yet appeared, is, though not altogether unknown, very remarkable; and indicates clearly that great care should always be taken to isolate and watch a dog, however apparently healthy, that has inflicted a bite or licked an abrasion—especially when hydrophobia is "about," and always to thoroughly cauterise or apply caustic to the part affected.

Case CXXX.— —— (Communicated by Dr. James Martin, Portlaw, Nov., 1877). On the 9th Feb., 1869, I was called to see J. Momfrey, æt. 36, suffering from a sense of spasm about the chest, which—knowing that he suffered from rheumatic heart disease—I attributed to that cause, particularly as the morning was frosty. Some slight allusion to pain along his spine, started the idea of hydrophobia in my mind, and inquiry led me to discover that he had been bitten very slightly, the skin being barely raised, on the back of the left thumb, fifty-eight days before; that the dog was for the succeeding week very irritable, and died seven days after having bitten him, as did two other dogs with whom he had been housed; still no idea of mischief had been excited, no precaution taken. I had him removed at once to the Leper Hospital, Waterford, where he was treated with calomel and opium, blister-

ing along the spine, subcutaneous injection of morphia and atropine, but he died forty-eight hours after admission, seventy hours from the first complaint he made of being at all amiss.

CASE CXXXI.—Richard Cheshire, bitten badly on the hand by a mad dog.

Result and Time of Attack.—One month after. Fatal.

Remarks.—Dr. Iles said: I first saw deceased on Saturday afternoon. He was then lying upon his bed partially undressed. He complained of suffering from a spasmodic difficulty of breathing, which he said came on occasionally, and from an inability to swallow liquids. I remained with him half an hour, during which time he tried to swallow a little milk. He took the vessel containing it into his hand and raised it to his mouth, but the moment the liquid touched his lips he pushed it from him and exhibited great repugnance to it, shortly after which he suffered from a spasmodic attack in the throat. On recovering, he told me, in a perfectly rational manner, that he had been severely bitten on the hands and left wrist by a dog on September 27th. He told me he was walking along the St. Alban's Road, when a black retriever dog passed him, and after it had run a few yards it turned back and walked by the side of him, smelling at his coat-tails, and presently jumping on his back. He told me that he then shook a small cane he had in his hand at the dog, and said, "Get down, you brute," upon which the animal flew at him, and before he could recover or help himself in the slightest degree he had been severely bitten in the hands and wrist. Cheshire then walked on to Watford, where Mr. Rudyard, one of the resident medical men, cauterised his wounds and recommended him to go at once to University College Hospital, in London, where the operation was repeated. The only symptom of which Cheshire complained to me at this time was severe pain in the right arm extending to the shoulder. I saw the deceased later on, at 8.30 p.m. He was then raving violently, and spitting up frothy mucus. He knew the people around him, and he knew me. He tried to swallow some brandy and water, and managed to take a mouthful, but immediately ejected it with great violence. He quieted down a little after morphia had been injected under the skin, but he had a very rapid pulse, and his pupils were widely dilated. I saw him later on at 11.30 p.m. Since my last visit he had been able to swallow with great effort a little milk and a little brandy and water. He was perfectly sensible at this time, and comparatively cheerful; but his pulse was much weaker. When I left him he was trying to compose himself to sleep. I was sent for again at 4.30 a.m. on Sunday, but the poor fellow had died before I could reach his cottage. There is no doubt whatever that his death arose from hydrophobia.

Reference.—Report of inquest, Oct. 31st, 1877.

CASE CXXXII.—Elizabeth Webber, bitten through the nail of the middle finger of the right hand by a pet dog. Some boys teased the dog in the street until at last the animal, goaded to anger, turned and bit six persons. Five of them had the wounds cauterised.

Result and Time of Attack.—Died three months after in the Boston Hospital, America.

Reference.—New York Mercury.

CASE CXXXIII.—G. H., female, æt. 14½, mill hand, previously always healthy. On March 3rd, 1875, she was giving a cat some milk, when a pup nine weeks old, of Scotch terrier breed, snapped at her and bit the first finger of her right hand on the inner side of her nail. It bled a drop or two, and appeared all right in two or three days. The pup had not been well for a day or two, had refused food and drink, but there was no vomiting, and no saliva noticed about the mouth. During the afternoon of the same day, it snapped at and scratched slightly the hand of a younger sister. The father thought he would destroy it; whilst taking hold of it, it seized his thumb, and bit him rather severely, causing a wound, which bled freely. It was then drowned by the mother.

Result and Time of Attack.—Between six and seven weeks after. Fatal, third day.

Treatment.—Chloroform, hypodermic injections of morphia and injections by the rectum of chloral hydrate, which relieved the severity of the spasms.

Remarks.—The father and sister, who were bitten by the same animal, continued in good health. I may mention that in 1849 some cases occurred at Queensbury. From memory I send a *résumé* of the facts. A party of young men were at the Granby Inn, when a strange dog came in and got under the long settle; in the attempt to dislodge it several were bitten. Six weeks afterwards one died. At the inquest another, who had also been bitten, showed the mark on his hand; in a fortnight he was taken ill and died.

Reference.—Notes kindly furnished by J. H. Bell, M.D., Bradford, Yorkshire.

CASE CXXXIV.— ——, female, æt. 24, bitten by a dog suspected rabid. The wound was burnt with caustic soda three days afterwards.

Result and Time of Attack.—Eighty days after. Recovery.

Treatment.—After having tried the injection of morphia and inhalations of chloroform without any benefit, it was decided to try full doses of curara, seeing the good results which had been obtained in tetanus. A subcutaneous injection of two centigrammes of curara (about one-third of a grain) in water was administered. This was three hours after the sudden onset of the disease. A quarter of an hour later, there having been no visible effect, the

dose was repeated, after which the condition began slightly to improve—that is, there were longer intervals between the spasms, and the muscular movements became less, and finally ceased. This result induced a continued trial of the same treatment. The injections were continued, a somewhat larger dose (three centigrammes) being used. They were timed in such a way, that an interval sufficiently long between the doses was allowed for the physiological action of the drug, and for any manifestation of the curara-intoxication to be obtained. Thus, at twelve o'clock, the third injection was given, and the intervals of spasm became longer. In an hour another injection was ordered, and the intervals again became longer. At the same time the feeling of anxiety and oppression was less intense. A fifth injection was given at 2 a.m., and a sixth at 2.30. The intervals between the spasms now extended to ten minutes, and the pain in the chest and throat was almost gone. Indeed, there was a peculiar condition of hilarity and talkativeness, instead of the previous anxiety. Then the first appearances of loss of voluntary power just began to show themselves. After one more injection (the seventh) at 3.20, the spasms ceased entirely, and symptoms of a general paralysis of all voluntary movements became quickly apparent. The eyelids could only be moved with difficulty ; there was difficulty also in speaking. Breathing continued normal ; only twice was there any arrest of respiration, and this was overcome easily by making one or two rhythmical movements with the abdominal parietes ; the breathing then continued regular. After these toxic effects had lasted with this intensity about two hours, movements again became freer. Some hours after the last injection of curara, it was seen that the dread of water no longer existed, as the girl could drink freely without any difficulty whatever. The sensitiveness to light also disappeared, and indeed all the symptoms of hydrophobia subsided. Thus within four hours and thirty-five minutes, seven injections had been administered, representing altogether nineteen centigrammes of curara. During the course of the next few days, a mixture of symptoms, partly arising from the curara, and partly from the effects of the recent disease, developed. The latter consisted of slight muscular movements and involuntary spasmodic respiratory troubles, which for the most part were produced by the irritation of drinking, or fright, though they occurred spontaneously every now and then. On the evening of the next day but one, some of these symptoms assumed a serious aspect, and another injection of curara was at once ordered, after the administration of which they disappeared. These symptoms, though of much less intensity, continued to recur until the eighth day, after which they finally disappeared. The girl was discharged cured on December 3 of the

same year, and went into service a few weeks later. She is now in perfect health.

Dr. Offenbery's Remarks.—The favourable action of curara in human hydrophobia may be explained as follows :—The chief symptom certainly is the frequent spasms. These spasms, which become more violent after each attack, are the cause of the constantly increasing danger of the disease, and they are finally the cause of death, which results either from exhaustion or from acute asphyxia. Curara, unlike other narcotics, does not act directly on the nerve-centres, but seems to act rather on the peripheral nerves. Its chief action seems to consist in paralysing the motor nerves, and especially (and soonest) those of the voluntary and striped muscles ; then, after large doses, those of the involuntary muscles. An animal to which large doses of curara have been administered cannot move about voluntarily, neither can reflex movements be produced. If the motor nerves or even the spinal cord are irritated by a very strong electric current during the action of curara, muscular contractions cannot be produced ; the muscles seem to be cut off entirely from the nervous system. The administration of curara in hydrophobia is not new. Niemeyer seems to have been the first to have tried it. He injected in his case five milligrammes, and then one centigramme, at intervals of three or four hours. "This treatment seemed to be of temporary service, and to produce greater relief than very large injections of morphia." Niemeyer strongly urged a further trial of this drug in larger doses in other cases of hydrophobia. No other successful results seem to have been obtained. Gualla has used curara in four cases of hydrophobia, and without success, but it is doubtful whether his doses were large enough. Theoretical arguments, no less than the above case, seem to indicate that the paralysing effect of curara is necessary to secure success. This case also proves that life may be sustained in spite of general muscular paralysis, the chief effort being, of course, to keep up respiration by artificial means. There is less danger of cardiac paralysis. It is a misfortune that a definite dose of curara cannot be indicated, the doses variously allowed by authors ranging from one milligramme to fifteen centigrammes. The difference depends, probably, on the quality of the drug. Another explanation, however, may be given. The action of curara depends chiefly on the excitability of the nervous system. The greater, then, the excitation and the excitability, and the greater the physical exaltation, the more violent and intense will be the spasms, and the greater, therefore, must be the amount of the curara to hold these spasms in check. Thus, not only in different cases, but also at different periods in the course of the same case, entirely different doses of the same preparation will be indicated. A dose of curara, such as in a healthy individual with a normal nervous system, would pro-

duce decided effects on the motor powers, would produce scarcely any effect whatever on one who is the subject of hydrophobia. The knowledge of this circumstance is of great importance, and we may commence at once with larger doses than we should probably otherwise employ; yet the difficulties of administering the drug are only partially overcome, especially as we have to administer it until we get paralysing effects. Obviously the safest way, then, to administer curara is to give small doses, and to repeat them at short intervals, until the effects we desire are brought about; and as a subcutaneously injected dose is absorbed and commences to act in a few minutes, and further, as (according to Demme) the action of a dose of curara only lasts from four to five hours, so then we may most surely and safely obtain the effects of curara by oft-repeated small injections. Thus, if an injection be practised every half hour—a period of time which largely suffices in order to get the action, and the whole action, of an injected dose of curara—we shall be able within four or five hours to make eight to ten injections. In using curara in this manner, we not only secure its physiological action, but also guard ourselves against any sudden and too energetic manifestations of its toxic qualities. The action of small doses is proportionate both in intensity and duration, and so soon as any dangerous symptoms show themselves, we should withhold its further administration, and take precautions suitable to the occasion, as in the case just given. It is of importance to commence this treatment early on in the disease. If the spasms are still slight, very small doses will suffice; if they have become more intense, a corresponding dosage will be indicated. It must be remembered, however, that any possible toxic effect will also be proportionate to the dosage. Nor must it be forgotten that the administration of such a remedy itself produces spasms; the irritation of the injection-puncture may sometimes be so great that the patients will seriously dread it. The various precautions to take, then, and the dosage, will depend on the individual case, and must be left to the discretion of the surgeon in charge.

Reference.—*Veterinary Journal.* Dr. Offenberg, Prussia.

CASE CXXXV. — ——, male.

Result and Time of Attack.—Six weeks afterwards. Fatal.

Treatment.—Injections of morphia, hot air.

marks.—Fleming considers this an illustrative case, and s it in his work. The patient was admitted into one of the hospitals on August 12th, 1869, under the care of Mr. be.

ence.—"Rabies and Hydrophobia," p. 256. Fleming.

CXXXVI.—Charles ——, æt. 38, bitten on the hand by log. He took no precautions as regards the wound.

nd Time of Attack.—Forty-two days after. Fatal.

Remarks.—Dr. Deroy mentions the following as the most salient features in this case :—Intelligence definite ; consciousness of his condition ; speech jerking, and extreme agitation ; horrible difficulty in respiration ; almost continued spitting ; the sight of shining objects did not appear to irritate him (compare Romberg's case), but the difficulty in respiration was such that he could not tolerate any one near him ; the sight of water, wine, or any other liquids did not produce any disagreeable effect upon him ; water poured from a jug into a plate within two paces of him did not affect him. Dr. Deroy said to him, "If you cannot drink out of a glass or a cup, perhaps you can easily do so out of a saucer." But he answered sharply and angrily, "I am not afraid of the liquid you offer me, but how can you expect me to swallow water or anything else when I cannot even swallow air." Does not this reply, at once so simple, energetic, and sensible, indicate that in this disease the larynx and pharynx are equally affected with the same spasmodic contractions. (Translation by Fleming.)

Reference.—"Rabies and Hydrophobia," p. 251.

Case CXXXVII.—S. B., male, æt. 27, bitten on the bare arm by a rabid dog.

Result and Time of Attack.—Three months after. Fatal.

Treatment.—Morphia, chloral, bromide of potassium, ice to the spine.

Post-mortem.—Brain very much congested, both lungs congested and emphysematous, heart normal, the other organs healthy.

Reference.—Lancet, p. 959. 1877. Dr. Burnett.

Case CXXXVIII. — ——, male, æt. 51, bitten on the finger by a rabid dog. Finger cauterised.

Result and Time of Attack.—Five years after. Fatal.

Remarks.—Dr. Hulme remarks, "The details differ from the instances where the morbid influences of the patient's imagination simulates the real malady, and he recovers on the exposure of his delusion when the animal is proved non-rabid. Can the origin of such a convulsive attack in the saliva of a rabid dog be disputed on the ground of the long period which elapsed from the infliction of the wound? The nervous centres are quickly poisoned by serpent venom. True, a few molecules of vaccine lymph, implanted beneath the cuticle, develop constitutional changes in a fixed period. But can the remote consequences of venereal contamination be pathologically explained? At such uncertain intervals is the zymosis complete? Yet how tardily must the fermentation have taken place in the hydrophobia case related in the *Lancet* of June 30th, by Dr. Burnett, where the bare arm of a man was bitten on February 22nd, and he lost his life, after four or five days of an unmistakable attack of canine madness, on May 28th ; or in another case, cauterised recently at St.

Thomas's Hospital, fatal three months after! There may not be much practical advantage from pathology determining where an animal poison can nestle during five years. But on what grounds can its latency for such a period be controverted? Is there not an analogy between tuberculous exudation or cancerous infiltration arriving at the active state of malignancy, and the history of *materies morbi* in human rabies finally and fatally affecting the brain and spinal column? Why should the period of quiescence be limited without suspicion to months, and a doubt be thrown upon its prolongation for a few years?"

Reference.—*Lancet*, p. 220. 1877. Dr. Hulme.

CASE CXXXIX.—Frederick John Izard, æt. 8, bitten on the face by a dog, and the wound occasioned was cauterised by a doctor.

Result and Time of Attack.—About two months. Fatal.

Remarks.—The child seemed well in health up to the 21st October, 1877, when he complained of a headache. He became convulsed at the sight of water to such an extent that it required the united efforts of four persons to restrain him. Deceased, when attended by Dr. Harrison, of Coutts Road, said that there were a lot of flies hovering around, and he refused to take drink, especially in the form of water. He foamed at the mouth and became violent, and died on the 24th October, death being, from the evidence of Dr. Harrison, attributable to the bite of a dog.

Reference.—Report of inquest, November 1st, 1877.

CASE CXL.—A. C., male, æt. 9½, bitten on the right hand and leg by a dog; wound cauterised with nitrate of silver.

Result and Time of Attack.—Six weeks and three days. Fatal.

Treatment.—Chloral, bromide of potassium, injections, ice.

No *post-mortem.*

Reference.—*Lancet*, p. 421. 1877. Dr. R. Steele.

CASE CXLI.— ——, male, æt. 42, bitten on the left hand by a dog six months old.

Result and Time of Attack.—Seven weeks, four days. Fatal.

Treatment.—Morphia.

No *post-mortem.*—*Lancet*, p. 423. 1877. Mr. Rigden.

CASE CXLII.—Peter M. R., æt. 48, bitten on the left leg below the calf, by a strange dog.

Result and Time of Attack.—Eight months. Fatal.

Treatment.—Chloral hydrate, bromide of potassium.

No *post-mortem.*

Remarks.—The patient said he felt fully convinced that the wound had nothing to do with his present symptoms, as he knew the dog that had bitten him was not mad, but was alive at the present time.

Reference.—*Lancet*, p. 424. 1877.

CASE CXLIII.—C. J., a mason, æt. 17, bitten on the thumb and ball of the left hand by a dog supposed to be mad. The wound was cauterised with nitrate of silver.

Result and Time of Attack.—Two months after. Fatal.

Treatment.—Injections of morphia and chloral by enema.

There was no *post-mortem.*

Remarks.—This makes the third case of hydrophobia reported in Devon in 1877, where it had been previously unknown. As is generally the case, there was no fear of water or any liquids, and it was only when the patient tried to swallow that a paroxysm came on. The mere idea of swallowing anything was sufficient to set up violent paroyxsms. There was a gradual increase of temperature up to 103° F. from 99°, above which it never went, and this rise of temperature coincided with the development of the disease up to its most acute and characteristic appearance.

Reference.—Lancet, p. 567. 1877. Dr. Adams.

CASE CXLIV.—Arthur C., æt. 2 years and 9 months, bitten by a stray dog, which had bitten three other dogs. The wound was a lacerated one, at the side of the right elbow; it was cauterised with nitrate of silver, and dressed within two hours of the time when the bite was inflicted. It healed up very readily, leaving a slightly raised and thickened cicatrix. The child frequently spoke of the dog, showing that the recollection of the bite was exercising an influence on the child's nervous system. In this case the hydrophobic stage set in between the thirty-eighth and forty-eighth day, and death occurred before the end of the second day.

There was no *post-mortem.*

Reference.—Lancet, p. 568. 1877.

CASE CXLV.— ——, servant, male, æt. 63, bitten on the little finger by small terrier pup, aged three months. It was said by a veterinary surgeon to be rabid.

Result and Time of Attack.—Six months. Fatal, in seventy hours.

Treatment.—Injections of morphia.

No *post-mortem.*

Remarks.—This patient was very nervous, as during the year 1869 there had been rumours of cases of hydrophobia having occurred in the town.

"Five cases of hydrophobia said to have occurred in Halifax during the past five months." (*Lancet,* p. 213. 1869.)

The almost incredible number of four were under the care of one practitioner, by whose diagnosis the register of deaths for the year 1869 is thus increased, in one class of disease, and the total percentage of deaths from rabies throughout England in proportion to population, very peculiarly affected. The deaths in 1869 from rabies were 19. We have looked in vain

through medical journals for notes of these four cases ; the fifth we traced, and are enabled to give above through the courtesy of the surgeon who attended.

Reference.—For these notes we are indebted to Mr. William Nowell, Surgeon, Halifax Infirmary.

Case CXLVI.—H. B., ship boy, æt. 15, bitten by a dog, merely an abrasion, across the back of the hand. Wound cauterised with nitrate of silver. The dog had bitten five or six other people, and was undoubtedly rabid.

Result and Time of Attack.—Seventy-five days. Fatal, on the first day of admission to hospital.

Post-mortem.—The autopsy exhibited all the typical changes. There were muscular rigidity of the body generally, purple lividity of the tongue, injection of the fauces, œsophagus, and cardiac end of the stomach ; turgidity of the arachnoid and substance of the cerebrum, cerebellum, and medulla oblongata, with many dark puncta in the various substances ; spinal cord not examined.

Remarks.—Sir William Smart considers this a case illustrating the development of the disease without fear, or knowledge of the character of the injury, as the boy never suspected that any ill result would arise from the bite. The other persons bitten had not suffered. The dog had been bitten by a Chinese dog, and Sir W. Smart has found that canine madness is mentioned in Chinese medical books, and is regarded as a highly dangerous and fatal disease. They recommend the cutting out of the part, and the administration of strong purgatives.

Reference.—Lancet, p. 565. 1877. Sir W. Smart.

Case CXLVII.— ——, male, bitten on calf of leg, wound excised and cauterised with hot iron.

Remarks.—This patient was well eighteen months after the date of the injury, but Dr. Balfour was informed that some seventeen or eighteen persons bitten at the same time had died within three months. They all refused treatment.

Reference.—Lancet, p. 599. 1877. Dr. J. Balfour.

Case CXLVIII.—

Remarks.—Valleix (Guide du Médecin Practicien, tom. iv. p. 752), following Chomel, recognised three kinds of pseudo-hydrophobia.

1. Simple horror of liquids, perfectly compatible with health, and oftentimes seen during pregnancy.

2. Symptomatic hydrophobia, of which he mentions a case occurring at the Hôtel Dieu. The patient was suffering from articular rheumatism, and suddenly developed furious delirium, dread of liquids, sputation, and pharyngeal constriction, dying in a few hours.

3. What he terms rabiform hydrophobia. He mentions an

instance of this form which he saw in the clinique of M. Louis.

We shall have to allude to this last form again. We may here remark Mead "On Poisons," p. 146, 1702 tells us "that authors have noticed dyskataposis (difficulty of swallowing) or hydrophobia in malignant fevers ; and a common melancholy has been seen to end fatally in it. He had seen it himself in the height of a violent hysteric disorder, and also in a case in which fits of a palpitation of the heart were attended with so great a degree of it, that it seemed not to differ from the true hydrophobia."

Case CXLIX.— ——

Remarks.—That the malady may be transmitted by the virus from a dead animal, has quite recently received another illustration in the case of M. Moreau, a veterinary surgeon of La Capelle, Aisne, France. In last July, M. Moreau was sent for to Lerzy, to examine the body of a dog which was supposed to have been affected with rabies ; and he did so, forgetting that he had a slight abrasion on one of his hands. In the last week of October he began to exhibit the early symptoms of hydrophobia, which he soon recognised. Dr. Mennesson attended him during the course of the disease, but no remedies or appliances afforded relief. The unfortunate man retained consciousness until the last, and his self-possession never deserted him. He implored his attendants not to inspire his breath, and shortly before he died he bade farewell to his wife and child.

Reference.—Veterinary Journal, Dec., 1877.

Case CL.— ——, male, æt. 45, bitten on the finger by his own rabid dog.

Result and Time of Attack.—Recovery.

Remarks.—This case was reported by Dr. Watson, of Jersey City, in the *American Journal of Medical Science*, July, 1876, and regarded by him and Professor Austin Flint as a pure case of rabies. The dog was mad, and a servant girl who was bitten at the same time, and by the same animal, died from unmistakable rabies. Curara was employed. The doses were augmented from 1-16th grain, 1-9th grain, to 1-6th grain, when after the third injection, the unfavourable symptoms subsided.

ANALYSIS OF PRECEDING STATISTICS.

We have analysed the facts presented in the foregoing pages, and have reduced them into tabular forms, in which the reader can easily discern the number of cases we consider examples of rabies, the number of spurious or doubtful cases, and the number of recoveries. Other facts, as age, sex, period of incubation, period of death, are also presented ; they may prove useful, by comparison with the figures of other observers.

TABLE I.

Genuine Cases of Rabies. All Fatal.	M.	F.	Number bitten by Dogs.	Number bitten by Cats.	Number bitten by other Animals.	Period of Incubation as regards Number of Cases.	Period of Death as regards Number of Cases.	Ages in Groups.
Numbers.								
1, 2, 4, 5, 7, 8, 9, 10, 11, 12, 14, 16, 17, 18, 19, 20. 21, 22, 24, 25, 27, 29, 35, 37, 38, 39, 40, 41, 42, 43, 45, 46, 48, 49, 50, 51, 52, 54, 56, 63, 64, 66, 60, 68. 71, 72, 73, 74, 75, 76, 79, 80, 81, 82, 84, 85, 86, 97, 98, 99, 100, 101, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 131, 132, 133, 135, 136, 137, 139, 140, 141, 142, 143, 144, 145, 146, 149.	88	15	92	7	Case 8, bitten by Fox. Cases 52, 76, bitten by Wolves. Case 149 poisoned by dissecting a rabid Dog.	1 month 17. 2 months 38. 3 „ 17. 4 „ 4. 5 „ 5. 6 „ 1. From 6 to 9 months 3. 9 to 12 m. 3. 12 to 18 m. 2. Uncertified, 13.	1st day 8. 2nd „ 20. 3rd „ 14. 4th „ 7. 6th „ 1. 7th „ 1. 11th „ 1. Uncertified, 51.	From 1 to 5 inclusive 6. „ 5 „ 10 „ 7. „ 10 „ 15 „ 11. „ 15 „ 20 „ 10. „ 20 „ 30 „ 9. „ 30 „ 40 „ 19. „ 40 „ 50 „ 3. „ 50 „ 60 „ 4. „ 60 „ 80 „ 2. Age unknown . . 32.
Total . . 103	88	15	92	7	4	103	103	103

TABLE II.

Recoveries Genuine.	Recoveries Questionable.
Nos. 28, 6, 26, 36, 55, 65, 67, 78, 134, 150.	Nos. 3, 13, 23, 47, 53, 58, 59, 61, 62, 77, 102. No. 70, recovery from tetanus.
Total . . 10	Total . . 12

TABLE III.

Illustrative Cases of so-called Hydrophobia.

Nos. 30, 31, 32, 51, 69, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 103, 148.

Total . . 17.

TABLE IV.

Doubtful Cases, evidence not being satisfactory.

Nos. 15, 33, 34, 44, 83, 130, 138, 147.

Total . . . 8.

Under the generic term "hydrophobia," we found the cases we have collected from the various treatises and journals consulted. Our records are imperfect, for those who have reported cases have but too often omitted to note many essential points, and we have had for some cases to accept such evidence as the report of a non-medical paper. In the future, it is to be hoped, such errors will be avoided, and that reporters will give all possible information as to the animal which inflicted the bite, whether spaniel, terrier, etc.; whether rabid or not, and also note whether preservative measures of any kind have been adopted. We have mentioned other particulars which might advantageously be included in such reports, in our introductory chapter.

French writers afford us excellent examples of method in this respect.

The cases, however, afford ample evidence:

1. That during the present century medical men have had but too many opportunities of studying the nature of this affection, of becoming acquainted with its symptoms, and of advancing our knowledge of its pathology.

2. That under the head of "hydrophobia," numerous cases

are included, which have no analogy with the specific disease, produced by the bite of a rabid animal. The distinctive symptom "hydrophobia," so named, may occur in other affections, characterised by symptoms, equally distressing, intractable, and oftentimes fatal.

3. That nearly every form of treatment has been employed, suggested either by superstition, empiricism, or reason.

4. That there have been numerous reputed cases of recovery, some of which are undoubtedly genuine.

We have appended short *post-mortem* notes, which are also imperfect, but may prove useful by showing what has been done in the past.

Lipscomb asks why modern dissection has not improved our knowledge of the disease, and answers, how can it be expected? In the greater number of cases, the appearances after death have been governed by the various medicaments employed for the relief of the patient.

The examination in many cases has been conducted by observers who have not had sufficient experience to distinguish between the different causes by which similar effects might be produced. The dead body has been examined with a sort of bias towards considering the disease, as the cause of all the appearances by which that body is distinguished from others; sometimes without any knowledge of the medicines which had been exhibited, without any previous information respecting the habits of the patient, and without any consistent ideas of the influences and effects of the several circumstances in producing what are often improperly denominated morbid appearances. A judicious and experienced physician should have no difficulty in accounting for inflammatory streaks and spots on the stomach of the patient who, during the disease under consideration, swallowed large quantities of nitrate of silver or arsenical solution. It may sometimes be almost impossible for the most enlightened practitioner to determine in how great a degree the appearances after death may have been influenced by spasmodic contraction of the muscles partially or generally. While, therefore, we lament the want of a more correct history of *post-mortem* appearances, we must hope that our contemporaries and successors may furnish more reliable data.

CHAPTER III.

GENERAL CONCLUSIONS FROM PRECEDING STATISTICS.

We have now the difficult task of vivifying the preceding statistics, of drawing deductions from them, and of pointing out the lessons they ought to teach us. The first question we have to consider is, whether such a disease as rabies exists? It is necessary to answer and discuss this point, for in the present, as in the past, we believe there are some who deny it a place as a special disease, and who assign the symptoms to nervous influence acting on special organisations. Girard supported this view, and he has had many followers. A surgeon at Brighton was so convinced that this was not a contagious disease, that he inoculated himself with the saliva of a rabid animal, and concluded by the fact of his doing so with impunity, that he had established his proposition. This form of proof is a most fallacious one, for we know by analogy from other diseases that certain organisms have an antagonism against specific poisons, and that in epidemics of the plague, cholera, and small-pox, a large proportion in virtue of this beneficent provision of nature escape. If it were otherwise, and if there were not some protection, such epidemics would be more widespread and more intensely fatal. In the present state of our knowledge, we cannot explain the why, or the wherefore, of the seemingly erratic selection of victims, except on

theories of doubtful acceptation, any more than we can explain why disease and death should have been introduced into the world. Dr. Ellison, in his lectures, points out instances of the denial of other contagious diseases; De Foe denied the contagion of the plague, and two students at Paris disputing the contagion of syphilis, inoculated themselves with the virus. Both became affected with the disease, and one of them in consequence committed suicide. They might have exposed themselves to the contagion of syphilis and gonorrhœa without contracting them, *per vias naturales*, as we know many others have done, but that would be no proof there was no contagion. We also know that hundreds of persons have been bitten by rabid animals without experiencing any bad result, and we grant all this to the advocates of the non-specific nature of the disease. But from the data and evidence before us, the conclusion is forced upon us, that there is a special disease, depending on a special poison, attended by a special train of symptoms of the most distressing character, amongst which difficulty of swallowing is one of the most prominent features, and this evidence is of the most positive and demonstrable nature This disease we shall call rabies. We must briefly give our reason for this opinion. In the earliest writings on medicine, we find accounts in which the aggregate of symptoms correspond almost with those observed in the present day, and this we may call the evidence of antiquity. We shall in an historical chapter enumerate those authors who have made reference to it. In various parts of the globe, separated by not only natural barriers, but by a dissimilarity of language, we also find mention of a disease, following on the bite of animals, and this we may call the evidence of geography. In modern times we also find writers in different countries, who have observed similar symptoms, as cause and effect, under conditions where imagination

could not play any part in the production of the phenomena. The evidence, especially as regards children, bears out the specific origin of the disease, and dismisses the idea of its being imaginary or a pure nervous disorder. One of our best modern writers, especially on this disease in the lower order of animals, Fleming, tells us that it is also capable of being produced at will in healthy creatures by inoculation, that the experiments of Renault of Alfort, Hertwig of Berlin, Eckel of Vienna, and a crowd of other veterinarians abundantly and conclusively demonstrate, unfortunately, that rabies is as definite and marked, in all its characteristics, as tetanus, whooping-cough, or any other well-known disease.

We are also convinced that the bite of an angry dog or of any animal will not produce this affection unless the animal be rabid; it may excite local inflammation, severe constitutional disturbance, and distressing symptoms. On this point we must endorse the opinions expressed by Fleming:

"Certain it is that nothing can be more erroneous or terrifying than the assertion that rabies may be induced by the bite of a healthy animal, and it must be strenuously denied that such a result is possible. No wound, injury, or bite from a healthy dog will produce the specific disease we call rabies, for if the bite given in anger by man, or animals not rabid, had such an influence, cases of rabies would be every-day events. Cur and other dogs are continually biting each other all over the world, and whoever has struggled, as I have, to sleep through the night in a Turkish locality, Scutari, for instance, in Damascus, in Cairo, or in one of the main thoroughfares of a North China town, such as Tientsin, will be ready to testify that sanguinary battles among the half-starved and mangy canine scavengers are matters of, at least, hourly occurrence; besides, in this country, so far as

our observation has extended, dogs kept purposely for fighting, the notorious bull-dogs, are those least affected with rabies." There are of course numerous objections to be met, as, Why should some persons who are bitten escape? Why is the latency, intensity, and period of incubation so varied? But these are objections equally applicable to many other forms of disease. Why in an epidemic of cholera do certain individuals escape? Why is the intensity of small-pox greater some years than others? Why do some have it in a confluent, and some in a simple form? Why is scarlatina one year of the most virulent, and another year of the mildest type? These are questions of a speculative and theoretical character, and may be answered by assigning such reasons as atmospheric influences, individual susceptibility or immunity, primary intensity, and subsequent diminution of the infecting media. But why have we, and what is, this atmospheric influence? How does the poison become diluted, exhausted, or burnt up? What is the nature of the resistance in the system, which during the same epidemic of small-pox protects one patient, makes him undergo the zymotic process, and covers him over with twenty pustules, whilst another patient, under seemingly similar conditions, is a mass of pustules from head to foot? May we not candidly and honestly, without any derogation of professional dignity, confess that these are problems, not perhaps inscrutable, but certainly at present not understood. The theories of *contagium vivum* may ultimately lead us on to a fuller knowledge of the hidden workings of nature, but at present we have not arrived at this consummation, for the germ theory does not explain to us the origin of special and individual poisons, as those of measles, scarlatina, small-pox. As we cannot expect figs to grow on thistles, or grapes on a gooseberry bush, so we cannot at present admit that the germs of all these diseases are the same, and their varying effects are

produced under individual favourable conditions. The more the germ theory is considered, the more do we see its difficulties, for though some light has been further thrown on it by researches on lactic fermentation, still without an extreme degree of evidence, we cannot accept the theory of a separate and individual ferment for each contagious disease. It is quite possible and conceivable that it may be so, but the majority will have to accept it by the exercise of faith. The utmost we can arrive at, then, is that every specific poison appears to have an incubative period, and though we know its effect will be produced in a certain way, yet we are ignorant of its operation during that period, until constitutional derangement sets in. The zymotic theory which is now so frequently used, to denote the introductions into the body of poisons, is only a modification of the opinions of old medical authors who wrote about ferments. The terms are changed, whilst the difficulty remains the same. We hope to throw light on the incubative period, for though many of the phenomena of life are unfathomable, yet it is our duty to investigate them as far as possible, and to endeavour to understand the laws by which they are governed; and though we may not be able to explain many of the problems in connection with rabies, yet we cannot deny its existence as a distinct and special form of disease.

2nd. From the data we also conclude that there is a distinct affection in which we have symptoms closely resembling rabies, purely arising from nervous influence, not that the patient imagines or simulates the affection, but the inability and difficulty of swallowing, the convulsive motions, the delirium, and other concomitant symptoms, arise from some derangement in the motor centres, or nerve centres. When we remember the protean forms of nerve disease, we shall not be so astonished at this assertion, and if we examine the following nomenclature of Dr. Althaus, we

shall see at a glance the diversity of nervous diseases; and by selecting the *italicised* words, we can formulate a disease, the totality of symptoms in which will resemble those of rabies in certain prominent features.

I.—General Neuroses.

1. *Nervosity, nervosismus, general hyperæsthesia, and convulsibility.*
2. Eclamspia.
3. Epilepsy.
4. Catalepsy.
5. Hysteria.
6. Hypochondriasis.
7. Chorea.
8. Tetanus.
9. Vertigo.
10. *Insomnia.*
11. *Tremor.*
12. Athetosis.

II.—Diseases of the Brain and its Membranes.

1. Hyperæmia.
2. Anæmia.
3. Apoplexy (cerebral hæmorrhage).
4. Thrombosis
5. Embolism of cerebral arteries } Softening of the brain.
6. Aphasia.
7. Meningitis.
   a. External pachy-meningitis.
   b. Internal pachy-meningitis (hæmatoma of the dura mater).
   c. Lepto-meningitis.
   d. Tubercular meningitis.
8. Encephalitis.
9. Chronic abscess of the brain.
10. Sclerosis.
11. Hypertrophy.
12. Atrophy.
13. Tubercle.
14. Tumours.
15. Syphilitic affections of the brain.

III.—Diseases of the Spinal Cord and its Membranes.

1. Hyperæmia.
2. Anæmia.
3. Hæmorrhage into the spinal membranes.
4. Hæmorrhage into the spinal cord.
5. *Spinal irritation.*
6. *Spinal exhaustion.*
7. Spinal meningitis.
   a. Pachy-meningitis.
   b. Lepto-meningitis.
8. Myelitis.
   a. Acute.
   b. Chronic.
9. Progressive locomotor ataxy.
10. Hypertrophy.
11. Tubercle.
12. Tumour.
13. Syphilitic diseases of the spinal cord.

IV.—Diseases of the Cerebro-Spinal Nerves.

1. Peripheral Paralysis.
   a. Paralysis of third nerve.
   b. Paralysis of fourth nerve.
   c. Paralysis of minor portion of fifth nerve.
   d. Paralysis of sixth nerve.
   e. Paralysis of portio dura, facial palsy.
   f. Paralysis of spinal accessory nerve.
   g. Paralysis of hypoglossus nerve, glossoplegia.
   h. Paralysis of vocal cords, aphonia.
   i. Paralysis of cervical and dorsal nerves.
      α. The serratus anticus muscle.
      β. The dorsal muscles.
      γ. The abdominal muscles.
   j. Paralysis of respiratory muscles.
   k. Paralysis of radial nerve.
   l. Paralysis of median nerve.
   m. Paralysis of ulnar nerve.
   n. Paralysis of lumbar and sacral nerves.
2. *Peripheral Spasm.*
   a. Trismus.
   b. Blepharo-spasm.
   c. Unilateral facial spasm.
   d. Spasm in the hypoglossus nerve.
   e. *Spasm in the spinal accessory nerve.*
      α. Clonic torticollis.
      β. Tonic.
   f. *Spasms of the nerves and muscles of the upper extremity.*
   g. *Spasms of the respiratory muscles.*
      α. Singultus.
      β. Tonic *spasm of the diaphragm.*
   h. Sternutatio convulsiva (convulsive sneezing).
   i. *Spasm in the lumbar and sacral plexus of nerves.*
   k. Tetany.
   l. Permanent muscular contractions.
3. Peripheral Anæsthesia.
   a. Anosmia, loss of smell.
   b. Amblyopia and amaurosis (optic neuritis).
   c. Loss of taste.
   d. Nervous deafness.
   e. Anæsthesia of fifth nerve.
4. *Peripheral Hyperæsthesia.*
   a. Headache.
   b. Spinal neuralgia.
   c. Tic douloureux.
   d. Olfactory hyperæsthesia.
   e. Auditory vertigo, Menière's disease.
   f. Cervico-occipital neuralgia.
   g. Cervico-brachial neuralgia.
   h. Ulnar neuralgia.
   i. Intercostal.
   k. Mastodynia.
   j. Neuralgia of the lumbar plexus.
   k. Sciatica.
   l. Neuralgia of the coccygeal plexus.
   m. Neuralgia of the joints
   n. Visceral neuralgia.
5. Neuroma.

V.—Special Forms of Paralysis.

1. General paralysis of the insane (dementia paralytica).
2. Shaking palsy (paralysis agitans).
3. Labio-glosso-pharyngeal paralysis.
4. Hysterical paralysis.
5. Lead-palsy.
6. Rheumatic paralysis.
7. Reflex paralysis.
8. Peripheral paralysis from injury to the nerves.
9. Infantile paralysis.
10. Paralysis after acute diseases.
11. Diphtheritic paralysis.
12. Scrivener's palsy.
13. Paralysis of the bladder.

VI.—Special Forms of Anæsthesia.

1. Cerebral anæsthesia.
2. Spinal „
3. Hysterical „
4. Toxic anæsthesia.
5. Muscular „

VII.—Affections of the Vaso-Motor and Trophic Nerves.

1. Megrim, sick headache.
2. Angina pectoris.
3. Graves's or Basedow's disease, ex-ophthalmic goitre.
4. Unilateral atrophy of face.
5. Progressive muscular atrophy.
6. Progressive muscular hypertrophy.

Dr. Althaus has recently told us that the rate at which diseases of the nervous system occur is a steady one, and subject to a definite law, to which there are not any, or only apparent, exceptions. That this rate does not appear to vary perceptibly from time to time, and amounts to about 12 per cent. of the entire mortality from all causes; and that nervous diseases occupy the fourth rank amongst the maladies destructive of human life, being only surpassed in fatality by zymotic, tubercular, and respiratory diseases.

We must dwell, for a short time, on this point, as at present it is a subject of interest, evidenced by the numerous letters we recently published in our columns. The influence of mind over disease has always been recognised, and Fleming, in alluding to the influence of a moral cause in the development of the symptoms of rabies, remarks that such

instances are not very surprising when we know what a wonderful influence the mind, or rather moral causes, exercise on the composition and secretions of the humours, and he enumerates several instances illustrative of the singular impressionability of individuals to fear and the development of symptoms of rabies in consequence. We must divide this nervous influence into two classes :—*A*. Where it acts after the reception of a bite from any kind of animal. *B*. Where it acts without the bite of an animal. We may point to our statistics for several specimens of these different classes. From "Rabies and Hydrophobia" we quote some further instances. A man, æt. 37, was admitted to the St. Louis Hospital, Paris. Six weeks before admission he had been bitten by a cat, but this circumstance he did not allude to when first seen ; he then complained of a pain in his left arm. Being afterwards interrogated, it was discovered the cat had been ill for some days, and had been killed soon after it bit him. The bite, which was on the left arm, had been cauterised by a druggist. Cicatrisation had been complete for some time, when one of his neighbours said to him, "I have hanged my cat ; yours bit it, and it went mad." The unfortunate man was greatly moved by this statement, and immediately afterwards experienced the first symptoms of the disease, which were not severe until the 12th of August, 1869, the date on which he was admitted to the hospital, where he soon after died. He also furnishes a case related by M. Bucquoy. A woman, in the clinique of Dr. Maisonneuve, had been bitten by a dog, which was supposed not to be rabid, and the injury had healed, when, two months after the accident, she was met by two students, who had been with the doctor at the time, and who asked her if she was not yet mad. Immediately she was seized with nervous symptoms, became intensely anxious and uneasy, and went into the hospital with the belief she was suffering from

rabies. She was put under the care of M. Laugier, and the following day was evidently affected with the disease. Hemiplegia appeared, with violent delirium, accompanied by an irrepressible amount of fear, and she died asphyxiated in forty-eight hours.

Dr. Fayrer, in his volume of "Clinical and Pathological Observations in India," narrates a fatal and extremely interesting case, in which a man of highly nervous temperament, shortly before he was bitten by a dog, read a story in *Chambers' Journal*, entitled, "The Longest Month of my Life." It was an account of a person bitten by a dog, who was assured he was not safe until thirty days had elapsed. The story made a very powerful impression on the man, whose symptoms set in on the thirtieth day—the eventful one of the story. In reference to the second class we have ample evidence of its existence in our statistics, and Fleming also referring to it (p. 262), says: "There is a peculiar hysterical affection or mental hydrophobia, as Trousseau named it, which simulates the malady, and is brought on by emotion on seeing hydrophobic individuals, through fear of the disease, or in nervous people on hearing a description of real cases of it. Dr. Michie, of Shanghai, informs me that when rabies was prevalent there in 1867, he was called up one night to attend a young man, who assured him that he had been unable to drink fluids since the previous afternoon, and who looked excited and haggard. By impressing upon him that the difficulty was imaginary, the doctor succeeded in getting him to drink some soda-water, and his hydrophobia soon disappeared."

Trousseau relates some instances of this imaginative affection. Whilst talking of virulent diseases in general to M. Joupitre, Mayor of one of the departments of the Sologne, this gentleman told him that he had been affected with hydrophobia. A farm dog had *tried* to bite his arm, and

about the same time it had bitten a good many beasts, which had died of rabies. A few months afterwards, on Easter Sunday after service, and at a breakfast, at which every one had done his best to make up for the rigid abstinence of the past Lent, M. Joupitre exclaimed suddenly that he was seized with hydrophobia. He could not eat or drink any more, and was already beginning to rave, when his wife, who only believed that he had eaten too much, persuaded him to tickle his throat with his fingers. The advice was good, for copious sickness was brought on by the manœuvre, and nothing more was said about hydrophobia. Trousseau named Joupitre's case to a presiding judge in chambers, who in his turn told him that he also had once believed himself affected. He used to go out riding frequently, and a sporting dog which generally accompanied him often jumped to lick the hand which held his whip. During one of these rides he met a flock of sheep, after which the dog ran, biting all those he could catch. The animal still heard and obeyed his call, but it had a strange aspect. Again it ran after, and bit, dogs, cows and oxen, and lastly swam across a river; a few hours later it died. A short time after this, the judge heard that many of the beasts that had been bitten by his dog had perished of rabies. This news alarmed him, because he recalled to mind that on the same day the dog had licked his right hand several times. On examining this hand, he found several small scars on it, and, seized with terror, he no longer dared touch water to shave himself, and finally believed he had hydrophobia. A medical man, who was sent for from Orleans, tried in vain to calm his fears; for several days he was excited and delirious.

At last, being told over and over again that persons seized with the disease died very rapidly, and that he could not therefore be hydrophobic, since his dread of water dated ten days back; and after reading in books about the dura-

tion of confirmed hydrophobia, he allowed himself to be persuaded, and his dread of water vanished as soon as he became convinced that he would have died long ago if he had been infected. We have here typical instances of the misleading name given to this affection.

3rd. We must also eliminate certain cases from our list, and assign them to their proper nomenclature. It is not astonishing to find mistakes made in the diagnosis of this affection, as the confounding of it with tetanus, especially when we remember the somewhat similar character of the symptoms. The following artificial table from Holmes' "System of Surgery," of the leading features of both diseases, will convey a brief though accurate differential diagnosis:

Rabies.	*Tetanus.*
Spasms of muscles of brief duration; if not voluntary, at least temporary, and ceasing to exist during intervals of rest and quietude, the jaw being relaxed, and opening and shutting regularly. The spasms are clonic.	Spasms of muscles more continued, less remitting, and more intermitting, constant rigidity of the muscles of the jaw becoming gradually fixed and closed; tonic spasm. The cause is exposure to cold or a wound; it rarely arises from the bite of an animal, and generally occurs soon after the injury. The bite of a tetanic animal does not produce tetanus.
Countenance.	*Countenance.*
There is an expression of excitement, fearful distress, and peculiar restlessness, occasionally frightful convulsions; the eyes are bright and glistening, but at times suffused. Thirst and aversion	Drawing up of the nose, wrinkling up of the forehead, angles of the mouth drawn towards the cheek-bone, presenting a frightful risus sardonicus. There is an expression of pain, but the eyes are

to fluids characteristic; even the sight or noise of fluids induce paroxysms, with frequent and viscid discharge of saliva.

Rabies.

Vomiting and gastric pains general, mind subject to rabid influences, and numberless deviations passing to delirium; intolerant sensibility of surface and organs of sense.

natural; no great thirst, and in general no great aversion to fluids administered in small quantities; rarely any discharge of saliva.

Tetanus.

Vomiting and gastric pains rare; mind generally clear to the last.

For instances of this error in diagnosis we may point to tables, and we may particularly refer to the one recorded in the *Lancet* (1848), as one of tetanus and rabies combined, where a boy, Charles G——, was struck with a stone on the lip, and was also supposed to have been bitten.

4th. Mania has also been confounded with it, and our statistics furnish notable instances of this mistake.

5th. In our introductory observations we mentioned a supposed case of rabies, by Dr. Whymper, and stated that in certain forms of heart-disease and pericarditis somewhat simliar symptoms to rabies are produced. Since writing, we have received further confirmation of our views, for in the *Progrès Médical* (September 15) we find that M. P. Bourceret took as the subject of his thesis at the Faculty of Medicine, Paris, "On Dysphagia in Pericarditis and a special form of it simulating Hydrophobia." We have not been able to obtain the book, but Dr. Bouteillier in his review says:—"The disease thus described is very rare, and we should be on our guard against affections which we only meet once or twice in practice, and which are difficult of diagnosis if we do not remember the symptoms. We may thus confound pericarditis in its hydrophobic form with

rabies, if we do not carefully examine the chest. In chest effusion and in pericarditis there are symptoms which suggest rabies, but which in reality are due to the former affections. M. Bourceret has published a case which occurred in the service of M. Bernutz. The patient had dysphagia, hydrophobia, and attacks of dyspnœa, to which he finally succumbed. The autopsy revealed adhesions of the mediastinal pleura and of the pericardium, and inflammation of the left phrenic nerve. After an anatomo-pathological discussion, and an *exposé* of an experiment made on dogs in the laboratory of M. Vulpian, M. Bourceret attributes this affection to the action of the phrenic and pneumo-gastric nerves. He produced symptoms of hydrophobic pericarditis by inducing inflammation, of the pericardium of the mediastinal pleura and of the left phrenic nerve." It is interesting to compare the *post-mortem* appearances of the body of Henry Bailis, in reference to the state of the pericardium.

6th. In the *Lancet* (1824), in the Lectures on Poisons at St. Thomas's Hospital, we find mention of inflammation of the œsophagus, giving rise to symptoms of rabies. The patient never had received a bite, and upon examination after death the œsophagus, behind the heart, was found to be greatly inflamed. In the *Medico-Chirurgical Review* (1826), we have another case, where we may conclude with the writer, that inflammation of the mucous membrane was produced by the ingurgitation of cold liquids, when the body was heated, and that this inflammation gave evolution to the whole of the phenomena described. It is a curious case, and we give it in full :

J. Kneiss, aged 48 years, of sanguineous temperament and in excellent health, received a slight scratch from a dog that did not evince, either before or after, any appearance of rabies.

He took no notice of the accident. Nearly two years

after this having drank freely of cold liquids while heated by work in the month of May, he soon experienced a difficulty of swallowing fluids, a sense of weight in his limbs, and a feeling of intense cold all over his body. He took some cooling medicines, and on the third day there was violent fever, great thirst, and such a spasmodic affection of all the parts about the œsophagus and larynx, on the attempt to swallow liquids, that he fell into a kind of delirium. This was reproduced by each succeeding attempt. On being received into the hospital of Bamberg, under the care of Dr. Pfeuser, he presented, besides the foregoing symptoms, a remarkable velocity in all his movements, a loquacity of speech, and a furious expression in his countenance. The pulse was quick and full, the action of the heart precipitous and sometimes suspended, skin hot and dry, thirst considerable, tongue coated, urine scanty, red, and turbid, deglutition of solids easy. He was bled to thirty-two ounces, and had a laxative enema. The ensuing night was spent in dreadful agitation, with occasional delirium, convulsive movements, and fits of lypothymia. The pyrexia now ceased for a time, and calomel and belladonna in small doses were prescribed, while mercurial friction with the same were applied along the spinal column. The thirst soon afterwards became intense, the pupils dilated, and a frothy mucus was ejected from the mouth. These symptoms continued for two days more, and the sight of water or any other liquids produced horrible convulsions. The patient complained of intense pain in the region of the stomach, and the tongue seemed inflamed. Eight ounces of blood from the jugular vein, and twenty leeches applied to the neck, and sinapisms to the lower extremities. In the evening severe paroxysm of agitation, and thirty-two ounces of blood were abstracted. A complete remission of all the symptoms followed, the patient was calm and collected, full

of hope, and swallowed whatever medicines were offered to him. This state of tranquillity lasted all day, and in the beginning of the night he had three hours' calm sleep. From this period he fell into a state of extreme apathy, stupor, and complete prostration of the physical and intellectual forces. He died in a few hours afterwards.

Post-mortem.—The cerebral substance was extremely soft, spinal marrow sound, salivary glands very much swelled. Some gangrenous eschars on the pharynx and larynx, the vessels of which were extremely injected, thyroid gland enlarged, changed in colour, soft, and full of thick black blood. Œsophagus inflamed throughout its whole extent, and presenting some spots of gangrene, the diaphragm in the same condition, mucous membrane of the stomach and duodenum very red, pancreas in the same stage as the salivary glands.

7th. Fleming, to whose researches on rabies in animals we shall have occasion frequently to refer, points out (p. 299) "That Heusinger has observed that there is undoubtedly a type of intermittent fever in man (which he fancies has some relation to anthrax), in which not only hydrophobia and dysphagia, but also, as happened in the case of Puccinotti, all the symptoms of rabies are present. This is named 'febres hydrophobicæ' by many surgeons, and as the same authority remarks, Faber is reminded, perhaps not without reason of the epidemy, which broke out among the Roman soldiers after the conquest of Rome in A.D. 553. Certain observations of this kind are communicated by Torti, and especially by Notarianni, Dumas, Puccinotti, and Rasso."

8th. "Hydrophobia" has also been observed after epilepsy (Brieu), in acute articular rheumatism (Basedow, Valleix), in peritonitis, in melancholia, in putrid fever (Bonafos), in acute tonsillitis (Mayo, Vidal), after the sudden cure of scabies (Hirz and Jeitteles), in meningitis, during pregnancy,

in hysteria, in peri-pneumonia, after intoxication, in encephalitis, and after great heat, following excessive exercise. Illustrative cases will be found in our tables, with references.

The treatment from the earliest times affords practical illustration of a formula attributed to Trousseau; that in presence of a malady which constantly terminates in death, the practitioner's duty consists in boldly trying everything. There could not be a more mischievous, or a more dangerous doctrine, and if it were applied to any other disease, as tetanus or epilepsy, it would be at once scouted from the list of therapeutical indications.

Every physician, worthy of the name, will treat this malady on the general principles which should guide the practice of medicine. When the powers of nature are sufficient to ensure recovery, most modern honourable physicians do not interfere with Nature's working by medicines, and when they have to deal with diseases they may believe essentially fatal and incurable, they do not hazard experiments with deadly remedies. So in rabies, the physician will select from those agents, the action of which bears some relation to the supposed nature of the affection, and whose power of relieving pain he can control. He may be tempted to apply remedies, the curative nature of which cannot be explained on logical grounds, but the efficacy of which rests on empiric practice; following out rational medicine and its rules, deadly poisons will be avoided. We might even say, it would be more conscientious to administer one of the vaunted secret remedies, than to recklessly inject the wourali poison. Of course the conscience of each individual will afford some guide in this respect, but we would prefer to answer for a possible error of omission, than for a palpable sin of commission.

The authority of Trousseau, or any other eminent medical name, cannot support a dogma based on questionable

morality; this opinion is certainly not in accordance with modern scientific medicine. Not only in reference to rabies, but also to other diseases, there is a tendency to accept dogmatic opinions as truths of the first order, and we would impress upon students in medicine the consideration of the few following words, when authorities are quoted:

"Let not the authority of the author be in thy way, whether he be of little or great learning, but let love of simple truth lead thee to read."

"Inquire not who may have said a thing, but consider what is said."

If we compare the various plans of treatment, especially in the earlier years of this century, we cannot wonder at the fatal results, especially when we remember how the patient has been bled, weakened, and then freely dosed with such poisons as prussic acid, belladonna, nux vomica, acetate of lead, etc., etc. It is difficult to distinguish the phenomena, arising from the mixture of such poisons with the blood, from the poison of rabies. The administration in large doses of medicines which themselves produce tetanic spasms, stricture of the muscles, irregular respiration, convulsions, and death, in a disease in which irregular muscular action is one of the leading peculiarities, cannot be justified, except on the theory of boldly trying everything.

During later years there has been a marked improvement, as far as regards the administration of such medicines, and though we cannot congratulate ourselves on a much more successful issue, yet we may note with satisfaction the more humane spirit, the avoidance of the reckless, dangerous, and irrational methods which distinguished the treatment of earlier physicians. Attempts must be made, no doubt, to palliate the most urgent and distressing symptoms, but we hope to show these attempts must be made, guided by the same light that distinguishes our treatment of other diseases,

as insanity and epilepsy. As Fleming observes, the few instances of recovery recorded in the annals of medicine afford a glimmer of hope that others may be noted in the future, and that our increasing knowledge of physiology and pathology may enable us to contend more successfully with this disease than hitherto. We believe that we are emerging into a clearer light, and that modern scientific medicine will still further assist in arriving at the true pathology of this disease. At present we can but briefly allude to the special points wherein progress has been made. In 1829 we find the first foreshadowing of some rational explanation of the phenomena which, in the present day, finds favour with many eminent medical authorities and writers. As regards the animal world and its varieties, Fleming's views may be considered as the nearest the truth, whilst for man the microscopic sections exhibited by Dr. Clifford Allbutt may be considered the starting-point of a more advanced stage in the history of the pathology of rabies. We shall, when analysing the results of *post-mortems*, give in full his observations, so as to compare them with previously observed facts, and thus test their actual value, whilst the pathology of those diseases in which we have somewhat similar symptoms, will also throw some light on the nature of the true affection.

The past, then, should teach us lessons, and one of the first is the desirability of an accurate diagnosis. There are difficulties in the way of this, and hence our accounts of the disease are often incorrect, contradictory, and sometimes false; other diseases having been confounded with it, as we have clearly demonstrated. This should not occur. It is a question of national importance that the death-rate from rabies should be acurately known. It has been influenced and swelled by certifying the cause of death as rabies or hydrophobia, when it really should be assigned to

some other cause. Without wounding the *amour propre* of the profession, we would suggest the extension of the powers of the medical officers of the Privy Council, so that every case of rabies should come under the notice of one of the department. Thus, virtually, the medical officer in charge of the case would have at his disposal a highly-qualified and scientific consultant, who would assist him both in diagnosis and, as we shall subsequently show, in the treatment of this painful and intractable disease. We have every confidence in the honesty of purpose and the veracity of those who have recorded cases as hydrophobia, which we have had to eliminate from that class of disease and to assign to their proper class. Mistakes will occur again, but we should guard as far as possible against such errors, and we believe our suggestion affords a satisfactory solution of the difficulty in preventing them, and of doing so without offending the sensibilities of our humblest or highest members.

At present, zymotic diseases, as regards causation, come under the cognisance of special government officials, and both the profession and society have benefited thereby. We are only asking for an extension of these powers, and as we are all striving to arrive at truth, we feel confident that the profession will accept help from whatever source, with this object in view. In the chapter on treatment we shall have to return to this point. In reference also to the new remedy, curara, the profession should not be over-sanguine, and we shall in the treatment lay down the conditions under which it should be used. It has been tried before and failed. We are enabled to give from our own pages, an abstract of the report on two cases which occurred at Milan. In the face of this evidence, our restrictions on the use of curara will appeal to the common sense of our *confrères.*

Bossi.

Result and Time of Attack.—108 days after. Fatal, in sixty-seven hours.

Treatment.—Curara was used. In twenty-seven hours, forty-one injections were given with the syringe of Pravaz. Each containing $1\frac{1}{4}$ gramme of curara distilled in distilled water, $18\frac{3}{4}$ centigrammes were therefore injected.

Remarks.—A commission was appointed at the Milan Hospital for the purpose of testing this remedy, wourali or curara ; it has been tried in hydrophobia, but without good results, though we have three cases reported which recovered after its use. The following are the terms in which the commission embodied the result of their report on two cases :—1. In the case of Bossi there was no cauterisation ; Broggi was cauterised simply with nitrate of silver seven hours after the bite. 2. The prodromic symptoms were manifested in Broggi fifty-eight days after the introduction of the virus. 3. The duration of the disease from its development to death in Broggi was 103 days. 4. At no moment did the curara appear to act on the rabid symptoms. 5. In both cases there was profuse perspiration, and in Bossi a marked but passing action on the circulation, evidenced by a quickening of the pulse. The autopsy showed in both cases red colouration and fluidity of the blood.

Reference.—Dublin Medical Press, p. 575. 1862.

The poison is so deadly, moreover, that its use necessitates the most anxious care, not only with regard to patient, but operator as well, and indeed all who come in contact with it, for if the merest scratch is touched with it the consequences may be of the gravest kind. When administered by the mouth, its action is so modified that the effects have not been perceived. As a remedy for rabies the injections should be small and repeated, and so timed that the physiological effects of the curara may be obtained in the intervals. In two of the cases of cures reported in our tables, each injection consisted of about one-third to one-half of a grain of the drug, the total quantity employed in each case being about three grains.

We have obtained samples from Messrs. Corbyn, Stacey, and Co., of guaranteed strength and purity, in a solution, made at our request, of three strengths—1 in 10, 1 in 12,

and 1 in 15. The first will allow of half a grain being administered in a moderate injection—5 minims. The second will allow of a grain being divided more easily into $\frac{3}{4}$, $\frac{2}{3}$, $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{3}$. The third will be safer to use by reason of its being weaker, besides which 5 minims will contain one-third of a grain, apparently an average dose. The solution form is one of the best methods of applying it. It may also be obtained in gelatine discs containing a definite proportion of this poison, as 1-100th of a grain, but a filtered solution carefully made does not create local irritation, whilst it allows control over dose. Of course there are other firms who can also supply it.

The effects of curara have been learnt by experiments on animals, and though every surgeon has the right of testing it on a patient suffering from rabies, yet he has not the power of first satisfying himself about the strength of his remedy, on the lower animals, unless he is a licensed experimenter. Strange anomaly in the law, which permits the surgeon's experiments on man, yet protects other animals!

We do not apprehend that surgeons will recklessly or carelessly use this potent drug. We know the profession too well to think that they would trifle with human life, but we have dwelt on this to show agitators the illogical position of the anti-vivisectionists.

There are these dangers, then:

1. If the surgeon, not knowing accurately the strength of his preparation, develops the physiological action too soon, he may poison his patient from the potency of his sample.

2. Whilst feeling his way cautiously on his patient he may lose valuable time, and his patient may die.

This information we are giving may be useful in time; at present we cannot, with the data we have, recommend

its indiscriminate use, and we shall lay down what we consider the conditions under which it should be used.

As we have laid our data before our readers, they can themselves form their own judgment upon them, and this we would recommend, so that they may not be guided alone by the *ipsi dicunt* of any men; and as we are all engaged in the one laudable object of the search after truth, though many may disagree with our deductions, yet such disagreement, if it leads to a more successful treatment, or to a better understanding of the problems we are trying to solve, will not be displeasing to us. We have necessarily devoted much space to our general conclusions, and these will have again to be subdivided under various heads. Our next chapter will be devoted to Rabies, its Morbid Anatomy and Pathology.

CHAPTER IV.

MORBID ANATOMY AND PATHOLOGY.

On looking at the *post-mortem* records superficially, certain prominent and almost persistent features will at once strike the eye—as general vascularity, congestion of various organs, and of the mucous membrane of various parts of the body; appearances found not only in genuine cases of rabies, but also in the simulative affections. The changes especially found in the larynx, pharynx, trachea, and bronchi, led Trolliet to believe that he had discovered the true pathology of this affection. Trolliet has been considered an authority,* as he devoted considerable attention to rabies, and made numerous *post obit* examinations. The result of his dissections may be thus summed up: extensive mischief in various organs remotely situated from each other, the chief of which are the changes in the mucous membranes of the trachea and bronchi, and the membranes of the brain, especially the pia mater, all of which are infiltrated with red blood, from inflammatory action. The mucous membrane of the bronchi, and trachea, covered with a frothy material of a peculiar kind, which M. Trolliet supposed to be the seat or vehicle of the specific virus, which, in his opinion, was driven forward into the fauces and intermixed with the saliva by each expiration from the chest. The capillary

* "Nouveau traité de la rage:" Trolliet.

vessels of the lungs congested, the substance emphysematous, the blood black, uncoagulating, and of an oily appearance; the mucous membrane of the mouth and pharynx of a pale grey, and lubricated by a gentle moisture, containing no saliva or any frothy material. The salivary glands, and the substance which covers them, afforded not the slightest vestige of inflammation, nor of any alteration in volume, colour, or texture. Other observers have noticed somewhat similar appearances. Thus, Mayo* summarises the results of *post-mortems* as follows: A slightly swollen state of the mucous glands at the root of the tongue, and a trifling increase of vascularity, hardly amounting to inflammation, and greater or less in different instances, of the mucous membrane of the epiglottis, particularly at its edge, and of the upper part of the larynx generally. These appearances alone are constant; of those which follow, some are always observed, so that to a certain degree they are alternative. The mucous membrane of the pharynx and of the stomach, one or both, are often inflamed at one or more parts, in patches sometimes of a bright red, generally with less intensity. The membrane lining part of the bronchial tubes often displays a considerable increase of vascularity. There is commonly a slight increase of vascularity in the brain, and trifling effusion. Sometimes the interior aspect of the medulla oblongata has great capillary vascularity, attended even with ecchymosis. Mayo believed it was evident that these appearances, occurring with such irregularity, must be considered as effects, as results of the disturbance of the nervous system, evinced by the convulsive symptoms, although not shown by any appreciable alteration visible to the naked eye. He further believed that this pathological view was just, and was rendered probable, by

* *Med. Gazette*, vol. xxix. p. 548.

the consideration of cases which approached nearest in their nature to hydrophobia, as varieties of tetanus, and of nervous irritation from poisoned wounds, received in dissection.

Romberg* tells us the majority of observers agree in testifying to the following changes:—Congestion of the respiratory organs, partial and general reddening of the mucous membrane, extending from the glottis to the finest bronchi; accumulation of frothy mucous fluid, engorgement of the lungs with dark fluid blood, containing many air-bubbles and lobular emphysema; the cavity of the mouth is generally found to contain much viscid, whitish-yellow mucus. The papillæ of the tongue and the mucous glands of the mouth and pharynx are often much developed and prominent. Some patches of reddening and congestion of the vessels are visible at the pharynx and intestines, and especially in the stomach. Romberg also gives us the *post-mortem* changes in the dog, after Youatt and Hertwig; but as we have a more modern and equally credible witness, we shall use his evidence. Fleming† says:—The following may be accepted as the principal lesions noted in necroscopical examinations of the bodies of dogs which have died of rabies, some being less frequent and less marked than others, and a few being rarely observed. There is congestion of the brain, particularly at the base, as well as the spinal cord, and sometimes a serous effusion into these organs. The muscular system shows congestion, as well as the cellular tissue, the liver, and the kidneys. The lungs are not unfrequently greatly gorged with blood, as in animals that die of asphyxia. The spleen is also more or less congested, and frequently enlarged. The blood in the vessels is black and pitch-like, and furnishes little or no clots. The mucous membranes exhibit, perhaps, the most constant alterations. These are

* Romberg, "Nervous Diseases," vol. ii. p. 337.
† Fleming, "Rabies and Hydrophobia," p. 282.

redness of more or less intensity, extreme congestion of the vessels, thickening of the membrane, and hæmorrhagic effusion to a greater or less extent on its surface. More special details will be found in his work. The later views of Continental observers lead us to a step further on in our pathology, and we give a summary of the morbid appearance found in animals, furnished by Fleming :

From the very excellent and valuable annual report of the cases brought for observation or treatment to the Vienna Imperial Veterinary Institute, and published in the *Oesterreichische Vierteljahresschrift für wissenschaftliche Veterinärkunde* for 1875, we observe that in the session of 1873-4 there were no fewer than 125 dogs admitted as rabid, or suspected of being affected with rabies. Though some of the pathological alterations were so frequent that they could be accurately grouped, yet others were so inconstant that there could not be said to be any certain indication of the presence of the disease.

The following epitome is given of the results of the necroscopical examinations made of these animals :

a. Alterations in the brain : 1. Hæmorrhage into the subcutaneous tissue of the cranium of a suspected dog ; 2. Hæmorrhage into the dura mater of 2 rabid and 1 suspected animals ; 3. Injection of the pia mater and plexus choroides in 28 rabid and 2 suspected ; 4. Hyperæmia of the brain in 2 rabid ; 5. Softening of the brain in various degrees—from mere shining softness (*gläzend-und weichersein*) to complete pulpy liquefaction— in 35 rabid and 2 suspected animals (of these the whole brain was generally involved in 3 rabid cases, the cerebellum in 3 rabid and 2 suspected, the upper surface and base of the brain in 1 rabid animal) ; 6. Distension of the lateral ventricles, through a collection of serum therein, in 10 rabid animals, one of which had the right ventricle unusually dilated, while the left was normal.

b. Alterations in the circulatory apparatus and the blood: 1. Pericarditis in 1 suspected dog; 2. Capillary hæmorrhage into the pericardium in 2 rabid cases; 3. Hæmorrhage beneath the endocardium in 1 rabid case; 4. Alterations in the blood alone in 83 rabid and 28 suspected animals. The blood was of a light-red colour in 13 rabid and 1 suspected, fluid in the heart in 2 rabid, slightly coagulated in 5 rabid, and with a dense whitish fibrinous clot in 6 rabid and 1 suspected dogs. The blood was dark-red to black-red (*schwarzroth*) in 70 rabid and 27 suspected: (*a*) In the heart it was quite fluid in 11 rabid and 4 suspected; (*b*) slightly coagulated in 21 rabid and 11 suspected; (*c*) with a soft fibrinous clot in 9 rabid; and (*d*) it had a dense grey clot in 29 rabid and 7 suspected animals. Bacteria (*stäbchen*) in the blood were in some cases numerous, in others few; in none were they very abundant. Anæmia was present in 4 rabid animals.

c. Alterations in the spleen and mesenteric glands were noted in 68 rabid and 11 suspected animals: 1. Lymphatic nodules in the spleen in 1 rabid creature; 2. Enlargement of the spleen alone in 25 rabid and 3 suspected; 3. Tumefaction of the mesenteric glands alone in 21 rabid and 6 suspected; 4. Enlargement of the spleen and mesenteric glands in 21 rabid and 2 suspected dogs.

d. Alterations in the respiratory apparatus in 86 rabid and 16 suspected animals: 1. Marked pallor of the mucous membrane of the larynx and trachea in 2 rabid and 1 suspected animals; 2. Intense injection of the same in 51 rabid and 8 suspected creatures; 3. General dark discolouration of the pharyngeal, laryngeal, and partially of the respiratory mucous membrane, in 2 rabid and 1 suspected animals; 4. Capillary hæmorrhage at the entrance to the larynx in 1 rabid; 5. Capillary hæmorrhage in the laryngeal mucous membrane in 1 rabid; 6. Capillary hæmorrhage in the pleura pul-

monalis in 1 suspected; 7. Bronchial catarrh in 3 rabid; 8. Pulmonary œdema in 11 rabid and 4 suspected; 9. Pneumonia at the border of some lobules, seldom involving entire lobes; and 10. Hæmorrhage into the thoracic cavity from gunshot wounds in two suspected cases.

e. Alterations in the digestive organs: 1. Injuries to the tongue in 1 rabid dog; 2. Foreign bodies in the mouth and throat in 1 rabid and 1 suspected; 3. Stomach empty in 19 rabid and 1 suspected; 4. Foreign matter in the stomach—hair, wood, straw, grass, leaves, soil, cherrystones (and in one case a living horse-fly attached to the mucous membrane) in 56 rabid and 21 suspected; 5. Foreign matter, besides hair, in the intestines in 6 rabid and 3 suspected; 6. Blood in the stomach in 2 rabid; 7. Injection of the serous membrane of the stomach only in 43 rabid and 2 suspected; 8. Injection of the serous membrane of the stomach and intestines in 3 rabid and 3 suspected; 9. Pallor of the gastric mucous membrane in 1 rabid; 10. General redness of the same in 6 rabid; 11. Patchy redness of the same in 2 rabid; 12. Hæmorrhagic erosions and ulcers in the same in 40 rabid; 13. Marked yellowness of the intestinal mucous membrane and contents of same in 4 rabid; 14. General redness, with tumefaction of the intestinal mucous membrane, and tapeworm, in 58 rabid and 17 suspected; 15. Patchy redness of the mucous membrane of the small intestines, particularly involving Peyer's patches, in 27 rabid and 9 suspected; 16. Diverticular formations in 1 rabid animal.

f. Alterations in the urinary and generative organs: 1. Nephritis in 1 rabid and 1 suspected; 2. Cystitis and nephritis in 1 rabid; 3. Pregnancy, about three weeks, in a rabid bitch.

g. Alterations in the locomotory apparatus, probably due

to injury to the head, were discovered in 3 rabid and 13 suspected dogs.

In the *Centralblatt für die Medicin Wissenschaften*, Kolesemkoff reports the result of the examination of ten mad dogs, made in Rudneff's pathological laboratory at St. Petersburg. The parts examined were the cerebral hemispheres, the corpora striata, thalami optici, cornua Ammonis, cerebellum, medulla oblongata, medulla spinalis, and the sympathetic and spinal ganglia. The changes were always most marked in the ganglia, and were as follows :—1. The vessels were much distended, and filled with red corpuscles. Here and there along their course were seen groups of red corpuscles, and round indifferent elements (probably emigrated white corpuscles) scattered in the peri-vascular spaces. The walls of the vessels were spotted with hyaloid masses of various forms, sometimes extending into and obstructing the lumen of the vessel like thrombi. Not far from these were collections of white and red corpuscles. 2. There was found to be a collection of round, indifferent elements in general around the nerve-cells, sometimes penetrating into the protoplasm of the cells to the number of five or eight, sometimes in such number as quite to displace the cell-protoplasm. The number of migrated cells produced various changes in the form of the nerve-elements. The nuclei of the cells were sometimes pushed towards the periphery by the intrusive elements. In other cases the nerve-cells seemed entirely replaced by masses of round, indifferent corpuscles. These changes were seen even in isolated nerve-cells.

It is interesting to compare the older anatomists, and we shall dwell briefly on them.

Cappivacci, an Italian, was the first anatomist, we believe, who published an account of any dissections of this kind. His observations, with those of Zwingerus, Brechtfeld, and other writers, were republished in the *Sepulchretum*, and

then collected by Boerhaave, and condensed into a single aphorism.

The morbid phenomena discoverable in the body by dissection are generally the organs of deglutition somewhat inflamed, the lungs incredibly distended with blood, the heart full of blood, almost dry, the arteries full, the veins empty, blood in the arteries extremely liquid, and scarce coagulating in the air; all the muscles, viscera, brain, and spinal marrow dryer than usual (*Aphor.*, 1140).

Morgagni collected the evidence of his time, and after comparing observations with those of Mead, Plancus, Fabri, Brogiani, etc., came to the conclusion that the seat of the disorder was in the nerves and brain.

As far as the visible appearances can furnish us with data, the notes in the preceding statistics correspond in the main with the general observations of experienced pathologists; and though the medulla oblongata, spinal cord, and its membranes presented no other visible lesion but congestion, yet as the older anatomists did not overlook the possibility of changes—which were not, perhaps, apparent to the unaided vision, but which the microscope might supply—so we may more justly adopt this view. Doctor Aitken, we know, suggested such an hypothesis, and before him Dr. Copland* remarked that the absence of all lesion in these parts has not been satisfactorily shown, and whether the existing lesion be one of an inflammatory character, or one interesting the intimate structure of these parts in such a manner as to escape the detection of our unassisted senses, there are strong reasons for inferring that some changes actually exist in these situations, though it may not be limited to them, but may extend to the related and associated nerves, and even to the parts supplied by these sources and by these nerves.

* Article "Rabies," Copland's "Dict. of Medicine."

Dr. Holland, of Cork, consulted 393 monographs, besides an immense number of reports in various journals, and selected what he believed 120 cases of genuine rabies. From our own experience we can readily believe this. From his notes Dr. Shinkwin published some valuable and interesting lectures in the *Dublin Medical Press* of 1865, and we give an analysis of the pathological and anatomical appearances observed in these 120 cases.

The diseased condition which most frequently presented itself was a congestive, highly vascular, or inflamed state of the pharnyx, which occurred 19 times or nearly once in every six cases. He included under one head the congestion (probably venous), the state of injection (probably arterial), and the inflammation of the pharynx, as the recorders did not make any distinction between these three states. Next in points of frequency is a similar state of the mucous tract, bronchi, or lungs, taken either separately or collectively, which presented itself in 18 of the 120 cases, and passing from the mucous membranes to the state of the brain and its serous envelopes we find they were congested 13 times, or about once in every 13 cases.

The mucous membranes and œsophagus was highly inflamed, or vascular in 12 cases, or 1 in every 10, and descending this tract to the intestines, they are reported as having been distended with gas in 10 cases, or 1 in every 12. Congestion of the spinal cord occurred 7 times; unusual fluidity of the blood 7 times; congestion of the membranes of the brain without a similar state of the brain substance 6 times; and *vice versâ* 6 times; while the cardiac end of the stomach presented an inflamed appearance in an equal number of cases, about 1 in every 20. Congestion of the larynx and intestines was noticed 5 times, and all the viscera presented a normal appearance in 1 out of every 24 cases.

Our tables afford an interesting comparison with these results.

The conclusions the authors arrived at were:

1. That the pathological changes do not account for the symptoms.

2. That death may ensue in this disease without any trace of morbid change.

3. That all the pathological appearances hitherto recorded, must be considered as secondary or accidental lesions.

4. That the blood is probably the agent through which the nervous system is acted on by the poison.

5. That in all future autopsies attention should be directed to discover the physical, chemical, and microscopical changes occurring in the blood and nervous system.

Judging by the phenomena, and the symptoms, and by analogy, so far back as 1827,* pathologists formed the hypothesis that a morbid poison was introduced into the body, that its malignant influence was directed to the centre of the nervous system, but chiefly to the medulla oblongata; that the first symptoms were those of excessive morbid sensibility and irritability of the various nerves of sense, especially those distributed about the glottis; that in a considerable number of cases inflammation supervened about the base of the brain, the throat, the stomach, and other parts, though the disease sometimes terminated fatally before the marks of inflammation appeared.

The implication of the medulla oblongata is evident, and modern pathologists are only reviving older ideas in searching by means of the microscope for changes in its structure. Dr. Hammond, of New York, a short time ago obtained the credit of a great scientific discovery, and the *New York Tribune* gave a lengthy account of it, with a diagramatic

* "Med. Chir. Review," 1827, p. 238.

illustration. From this we are supposed to believe that rabies is a disease of the great nerve centres, as sections of the medulla oblongata were said to have revealed several small spots of different shapes and sizes, indicative of extravasated blood, especially in the vicinity of the origin of the spinal accessory and pneumo-gastric nerves.

The possibility of the alteration, foreshadowed as invisible to the naked eye, has been proved, and it would appear that there are some marked and important ones.

At a meeting of the Pathological Society of London, Jan. 7, 1872, Dr. Clifford Allbutt exhibited a series of microscopic sections from the cerebro-spinal centres of the two persons, Nos. 108 and 109, who died from this malady in Leeds. The specimens were taken from the cerebral convolutions, from the central ganglia, the medulla oblongata, and the spinal cord. Throughout all these centres were found the same morbid conditions, but in different degrees, and these were as follows :

1. Evidences of great vascular congestion, with transudations into the surrounding tissues. In all the grey centres the vessels were seen in various degrees of distension, their walls in many cases being obviously thickened, and here and there were seen patches of nuclear proliferations. There was a diminished consistence of some of the parts, particularly of the medulla. This seemed to be due to serous infiltration and soddening, as has been observed in the dog.

2. Hæmorrhages of various size. In many places a refracting material was visible, outside the vessels, due, apparently, to coagulated fibrinous exudate.

3. Little gaps, caused by the disappearance of nerve strands, which had passed through the granular disintegration of Clarke.

In addition to these appearances in the nerve centres, an

enlarged spleen had been found. In both cases the parts appeared to be affected in the following order, as regards severity:—1. Medulla; 2. The spinal cord; 3. The cerebral convolutions; 4. The central ganglia.

This was in accordance with the symptoms presented during life, viz.:

1. Reflex irritability in the region of the medulla, with no tetanic spasms.

2. Increasing irritability throughout the cord, with semi-tetanus.

3. Delirium.

Whether Dr. Allbutt has struck the key-note, others have followed in his footsteps, and confirmed the accuracy of his observations, and we must regard his discovery as an important era in the history of the pathology of rabies, for he has fixed, what was before considered only a possibility, and removed from the domain of speculation into the region of facts, the hypothesis suggested by the older pathologists. Dr. Coates has described the microscopical appearance in two of the cases which occurred at Glasgow. The coarse examination of the principal organs of the nervous system showed that the veins of the encephalon were distended with blood, that the surfaces of the arachnoid were smeared with blood-tinged fluid over the hemisphere, and that there were a few drachms of similar fluid in the ventricles. Microscopical examination of the cicatrix of the original wound showed that the skin and subcutaneous fat were infiltrated with round cells, the bloodvessels presented on their internal wall transparent globular bodies, like drops of an exuded fluid. In many parts of the cord and medulla oblongata, accumulations of round cells were found in the peri-vascular spaces of the medium-sized vessels, and similar cells were also found around the ganglion cells. In all parts of the system

there were numerous amyloid bodies, but only one hæmorrhage was discovered.

Professor Maurice Benedikt has claimed in the *Lancet*, 1877, a prior and somewhat similar account of the pathological appearances. His memoir was published in the *Archives* of Virchow. Professor Benedikt had the opportunity of studying the pathology of the disease in many cases of dogs, and in one case in man, and he attributes our imperfect information in respect of the morbid changes, which occur in rabies, to the circumstance that these changes are of a miliary character. He first notices, that in sections of the brain, clear or bright spots may be seen, in which lie a few ganglion cells and certain nuclei, the origin of which is unknown. When examined with a high power the bright spaces seem to be filled with a finely granular material. He objects to the application of the term "granular disintegration" to this condition, since it would be only giving an obscure appellation to a plain matter of fact. He regards the clear spots as being formed by the fine molecular basement tissue of the cerebral substance, from which the morphological elements properly belonging to it have been, so to speak, macerated out. He has also noticed, and depicted in a plate appended to his paper, hyaloid masses in the substance of the walls of the vessels, which as they enlarge trench upon and constrict the lumen of the tube, and at the same time burst outwards through the adventitia. Careful examination enabled him to satisfy himself that these hyaloid masses originatefrom the corpuscles of the blood, and chiefly from the red corpuscles which lose their pigment, enlarge, undergo alteration in form, and become confluent, after which they are transformed into diaphanous masses, that constitute the transparent bodies, looking like drops of an exuded fluid, discovered by Dr. Coates. Still following in the same track, on May 15th, 1877, Dr. Gowers exhibited before the Patho-

logical Society of London an extensive series of microscopical sections, illustrating the changes in the medulla oblongata and spinal cord in four cases of rabies. For two of these, which occurred at Sheffield and Hertford, he was indebted to Lockhart Clarke, and for the other two, to Dr. Wickham Legg.

The changes found resembled in the main those which have been described by Benedikt as occurring in the convolutions in the dog, and by Dr. Coates in the lower centres in man.

In all four cases the vessels of the grey matter were greatly distended, the distension being greater in the medulla, near the grey nuclei in the lowest part of the fourth ventricle. In three of the cases the larger veins in this position presented aggregations of small cells within the perivascular lymphatic sheath. These were in some cases as a single layer, in other cases densely packed, so as to compress the vessels they surrounded. In a few places these cells extended beyond the limits of the sheath. In most parts, similar cells were scattered through the tissue, among the nerve elements, and in some places, chiefly in and near the hypoglossal nuclei, there were dense collections of these cells, constituting in fact miliary abscesses. Similar smaller collections were seen among the fibres of origin of the hypoglossal and glosso-pharyngeal nerves; adjacent to many vessels were areas of "granular degeneration." In two cases many of the larger vessels, chiefly veins, contained clots, parts of which were evidently of ante-mortem formation, portions of the clot being different from the rest, darker, granular, or spongy in aspect. By some of these the appearance of embolism was closely simulated. Attention was drawn to the indications of formations *in situ* afforded by the gradation between the normal and the altered clot, and by the curved lines of pressure to which the clot had

been exposed immediately after its formation. One specimen presented thickening of the inner coat of a vein, opposite the older part of a clot, and the clot was reduced in size correspondingly, as if formed secondarily to the change in the inner coat of the vein. In this vessel there were round cells, in the peri-vascular sheath, and leucocytes within, accumulated in the old clot, and within the substance of the swollen inner coat, affording strong evidence that the cells outside were also migrated corpuscles. The nerve-cells presented comparatively slight changes, being merely slightly swollen and granular in some places, and surrounded with granular degeneration here and there. These changes were most intense in and about the hypo-glossal, pneumogastric, and glosso-pharyngeal nuclei, slighter in the nuclei of the auditory facial and fifth nerves, slighter also in the cord, and still slighter in the upper part of the pores. Dr. Clifford Allbutt has also found still less definite changes, most distinct in the medulla.

In Dr. Gowers' cases the change reached its maximum in the region of the "respiratory centre" in the medulla, which includes that prolongation downwards of the facial nucleus, which subserves the movements of the lips.

The paroxysms of spasm of hydrophobia are paroxysms of respiratory spasm. In the case in which the change in the respiratory centre was most intense, the paroxysms consisted of spasm of the diaphragm, and an inspiratory effort, in which the clavicles almost touched the lower jaw, and the lips were pressed against the teeth. Further evidence of the over-action of the hypo glossal nucleus, in which the changes were so marked, was afforded by one case in which a noise as of the tongue being smacked against the roof of the mouth occurred at the commencement of each spasm. Dr. Gowers concluded by alluding to the difficult question, of whether

these vascular changes are the initial lesion in the nerve centres, or are secondary to the irritation of the nerve elements by the blood poison. It was certain that embolism played no part in the process, the coagulation in vessels was also not essential, while in one case the absence of cell infiltration showed that dilatation might be the only morbid state of the vessels. On the other hand, the changes in some of the clots, in cases in which the symptoms lasted only three days, showed that considerable vascular changes must have occurred very early in the disease. Though we have acquired new and important data by these observations, and are progressing in, we believe, the right direction to a more complete knowledge of the true pathology of rabies, still we cannot affirm positively that we have found a characteristic lesion pathognomonic of it.

There are many difficulties in the way, and especially incubation, the period of which varies so much, and about which there are so many theories. Dr. Barry* rejects the notion that the hydrophobic poison is taken up and mixed with the blood after the manner of other substances similarly circumstanced, and that it does not produce its peculiar effects until after it has wandered through the *penetralia* during forty days or longer, as directly opposed to all analogy.

Some theorists† suggested that the virus which was afterwards to contaminate the circulation, is generated in the wounded part, from the germ first deposited there by the tooth of the dog, just as we see take place in variola, vaccinia, and syphilis, the period of assimilation from the inoculated part being different in all these. But as soon as absorption of this assimilated nature commences, the symptoms of the disease begin to show themselves. Reasoning from

* "Experimental Researches," p. 151. Barry
† *Lancet*, vol. xi. p. 809, 1827.

analogy, it is said that when a poison, whether mineral, vegetable, or animal, is applied to a wound, the animal is not affected until absorption has taken place ; for if an exhaustive cupping-glass be placed over the poisoned part, but one minute before the expiration of the time at which the poison is known invariably to produce its effects, the animal exhibits no symptoms whatever. This view, at first sight, seems supported by those cases where, when premonitory symptoms have appeared some time after the bite, the wound has been angry, inflamed, or again opened, but, unfortunately, as we see from all our statistics, such an occurrence has been rare, and the *post-mortem* appearances have not revealed any distinguishing features either in the nerves or other parts at the seat of injury. We may say one word in reference to the pustules and vesicles, that were asserted were found in the immediate vicinity of the wound, and under the tongue in the arch and sub-maxillary glands, between the third and ninth days after the injury. English observers have not established them. Romberg said that these hydrophobic vesicles turned out to be a hoax practised by a peasant of the Ukraine. This is not correct ; we believe appearances of the kind have been found, and may be observed in health. The existence of these "lyssi" after death has not been met with, for as Fleming says, Marochetti only asserted that they were to be searched for during the incubation of the malady. The *modus operandi* of the poison in the wound is our greatest difficulty, in the same way as there is a difficulty about explaining the intermediate action of other poisons, before the development of symptoms. Nevertheless, the excess of reflex action, and the exalted state of the spinal cord, justify us in placing it in the category of tetanic affections, whilst the symptoms, as they manifest themselves in the organs of respiration and deglutition, un-

mistakably point to some structural alteration in the medulla oblongata.

Dr. Dyce Duckworth's remarks, in his comments on the case reported by Mr. Russel Steele, are very interesting, and we therefore abstract them. He says, there is some discrepancy of opinion respecting the exact nature of the spasms. The commoner, and certainly the popular view, explains the difficulty as arising from a dysphagia, due to instability, or inco-ordinate action of the faucial and pharyngeal muscles.

But however this may be, there is also violent implication of the respiratory muscles. In the patient under notice, the efforts to swallow were attended with inspiratory spasms, not unlike those witnessed when a cold shower-bath is administered. These were clearly reflex in character, and set up by superficial afferent impressions, passing through the respiratory centre in the medulla oblongata, on to the ordinary and extraordinary muscles of respiration. Attempts at swallowing in rabies seem to excite the peculiar inspiratory spasms and other peripheral irritations also. He also grants that it seems less difficult now than formerly to co-relate the various phenomena owing to those recent researches we have just enumerated; and when it is remembered that the medulla oblongata is the centre both for the acts of swallowing and respiration, any trophical change of an acute character, such as is apparently induced by the venom of rabies, will fairly explain the phenomena of hydrophobic spasm. He adds that, according to Ferrier, the *mechanism* of the co-ordinating centres of the medulla has not yet been explained, but that the nuclei of the fifth, seventh, glosso-pharyngeal vagus, accessory vagus of the eighth and hypo-glossal nerves, are all found within the structure, is now succinctly taught in the best anatomical writings.

Had we not reason to say that some light would be thrown on the disease even by comparison with other affections with which it has been confounded? In fact they mutually throw light upon one another. As we have said, the *post-mortem* appearances, in what, for want of a better term, we may call similative affections, are nearly the same. Structural alterations from other causes may arise in the medulla oblongata, and as Dr. D. Duckworth says, the origin of certain nerves being admitted in that locality, we have necessarily disordered functions in the parts supplied by those nerves, and we have reflex excitability, convulsibility, respiratory spasm, and dyskataposis, misnamed hydrophobia, or dread of water.

Though there are many *lacunæ* yet to be filled up, though there are some missing links in the pathological chain, yet the progress made since 1870 offers us the greatest inducement to persevere in our efforts in still further elucidating the points in doubt and mystery. We cannot fairly say there is no pathology for this affection, as has been said—that it is useless to make autopsies, for all is known that will be known. Every physician who reflects, and who has the interest of his profession at heart, will agree with us, that we have a pathology, capable of improvement no doubt, but still far superior to that of many other diseases; and they will acknowledge the necessity of still further enriching our *post-mortem* records by careful anatomical notes, specially assisted by the microscope, should they have the opportunity of making an autopsy.

We may then fearlessly propound the following provisional conclusions:

1st. That the phenomena of rabies, as evinced by morbid anatomy, depend on structural alterations in the medulla oblongata and spinal cord, influenced by a specific virus, the *modus operandi* of which is yet involved in obscurity.

2nd. That the special morbid appearances found are quite in accordance with this belief or fact.

3rd. That the absence of some of the special appearances do not invalidate this assertion.

4th. That this view is supported by analogy from those diseases, with which rabies has been confounded.

5th. That further careful and accurate *post-mortem* notes are necessary to fill up the lacunæ or missing links.

We must look to the microscope to throw more light on these morbid changes, and for the further prosecution of research, in the direction pointed out. Owing to the position of the general practitioner, the constant calls on his time, and the laborious nature of his work, we can hardly ask him to spend so many hours, or days, over microscopical work, but we may impress the importance of a careful and accurate general examination, with notes taken at the time, and not filled up from guesswork. Further, he will assist in the elucidation of the problem by careful extraction of the brain ; and, in some cases, he may be able to send, untouched, both brain and spinal cord to one of those medical men who have made a special study of pathology, and whom we cannot mention without invidious comparison. There are, at present, a number to select from.

Some special precautions are necessary in transmitting specimens, both to avoid injury, *post-mortem* changes, and simplify the microscopist's work, by presenting him with a specimen, in as perfect a condition as possible.

6th. That as the microscope has confirmed the accuracy of the hypotheses, and thrown a flood of light on the nature of the structural alterations foreshadowed by the older pathologists, so we may reasonably hope treatment will proportionately advance, and that, guided by the light of a

more advanced pathology, we may at last be able to place rabies in the category of curable complaints.

Modern medicine has lifted mania, epilepsy, phthisis, and other diseases, from the sloughs of empiricism into the clearer region of science.

Rabies must follow.

CHAPTER V.

RABIES, ITS ETIOLOGY AND SYMPTOMS.

Definition.—A contagious communicable disease, depending upon the introduction into the system of a specific poison. It may be caused by any rabid animal, and all warm-blooded creatures are susceptible to it. An abrasion of the skin is necessary for the development of the poisonous effects. Both the cutis and the mucous membrane must be deprived of their epithelial layer, whether the communication be made by mere contact (slavering over excoriations), or by inoculation (bites). The poison is of a fixed and not a volatile character (Romberg). It is never communicated by cutaneous or pulmonary exhalation, through the intervention of the atmosphere. It never originates spontaneously in man. It is usually attended by some pain or uneasiness in the inoculated parts; feverishness, mental anxiety, hyperæsthesia, reflex sensibility, irritability, dyskataposis or difficulty of swallowing, headache, tremor, delirium, prostration, and death.

Synonyms.—Lyssa, Kuno-Lyssa, Phobodypson, Phangydron, Rabies canina, Rabies contagiosa, Entasia-Lyssa, Canine madness, La Rage (French), Die Hundswuth, Tollwuth (German), Rabbia (Italian), Hydrophobia (Spanish), Vallenskrack (Swedish), Vandsky (Danish), Byechenstvo (Russian), Byesnania (Servian), Wscieklizna (Polish), Wclek-

lost (Bohemian); Sag dīwānah (Persian and Turkish), Kelev-Schote (Hebrew, Arabic, Chaldaic).

Predisposing Causes.—It will be seen from our tables, that it invades alike the rich and the poor, and that every sex and age are liable to it, though the proportionate number of males is greater, partly owing to the greater exposure of men in the streets, and to the greater protection afforded by the dress of women. According to Romberg, accidental circumstances favour the development of the disease, after the poison has been received into the economy, and bodily exertions, mental emotions, and especially fear and external impressions, may act in this way. He illustrates this by a history recorded by Trolliet and two instances from Lenhossek. Youatt also observes that in animals the slumbering germ may be brought to life by excitement, and when dealing with rabies in animals, this point will be more amplified by the experience of a more modern authority. For the exciting causes we are indebted to Fleming. It may be safely affirmed, that the virus of every rabid animal will communicate the disease, and that there is every reason to believe all warm-blooded creatures are susceptible to the influence of the specific poison; and on looking through the tables it will be seen that a large number of cases were due to other animals besides the dog. It was believed, for a long time, that the primary disease was confined to such animals as naturally employed their teeth as weapons of defence; but experiments of a later date have proved this assertion to be erroneous. Eckel succeeding in conveying the disease from a he-goat to a sheep. He also successfully inoculated a dog, with the saliva of rabid herbivores. Berndt inoculated four sheep with the saliva of a mad ox, and they became mad. Breschet asserted that he had conveyed the disease by inoculation, with the foam, from the mouth of rabid horses and asses. Rey produced the disease first in

sheep by bites of a mad dog, and developed it in other sheep, from the saliva of the diseased sheep. The saliva of rabid sheep has produced rabies in rabbits.

Youatt gives an instance of rabies, conveyed from a horse to a man, who was physicking the animal, and had placed his hand, which was abraded, in its mouth. This excellent veterinarian also communicated the disease from the horse to a dog, and once from the ox to a dog. Tardieu mentions that in 1855, in the Department of Creuse (France), a sheep had been bitten by a mad dog; it bit the shepherd on his arm. Rabies developed in fifteen days, from which he died. The disease has been communicated from the ox to fowls, as demonstrated by Dr. Ashbourner in 1828, and later by W. King, of Clifton, who produced rabies in a fowl by inoculating it with the saliva of a cow that had just succumbed to the disease.

Zincke, of Jena, produced rabies in fowls by inoculating them with the canine virus, and Van-Swieten reports that an old woman died with all the symptoms of rabies from the bite of a cock, and as he could not admit that a virus not present in an animal, could be communicated by that animal, he conjectured that the cock was suffering from rabies, which had been imparted to it by a fox. The result of the experiments carried out by various authorities led Röll to assert that the bite of herbivorous animals suffering from rabies, as well as inoculation with their saliva or blood, will communicate the affection, though the contagious principle is not so active or intense as that derived from the carnivora.

It must not be forgotten that the facility with which the disease can be transmitted by different species, depends, besides the activity or degree of virulency of the infecting principle, upon the organisation, or rather nature of the diseased. Flesh-eating or carnivorous animals, as is well known, generally attack other creatures with their teeth,

which are well adapted for wounding and tearing, consequently they are the most successful in inoculating with the poison. Herbivorous animals differ in their habits and instincts, as well as in their aggressive weapons, from the carnivora, which render them less dangerous when affected with rabies. The horse's natural weapons are its hoofs, and it comparatively rarely employs the teeth, while the cow, sheep, and goat use their horns. The transmission of the disease by these animals is less likely to occur, even when a horse does bite; owing to the shape of the teeth, the skin is not so readily penetrated. There is conclusive evidence on the communicability of rabies from the human species to the lower animals. On the 19th of June, 1823, Magendie and Breschet, in the Hôtel Dieu, in the presence of many witnesses, gathered some saliva from the mouth of a man who was dying of rabies, and inoculated with it two healthy dogs. One of these animals became rabid on the 27th of July. Earle, of St. George's Hospital, London, inoculated several rabbits with the saliva of a patient affected with rabies; some of these became rabid. Hertwig and Renault also proved experimentally that the disease could be transmitted from mankind to the canine species. Many cases are reported in which the malady has appeared in mankind, from scratches from cats' claws; but in all probability these weapons had been previously contaminated by the saliva, as rabid animals frequently use their paws to remove the viscid secretion that obstructs their mouths.

We may here again mention that nothing can be more ...eous or terrifying than the assertion that rabies may be ...d by the bite of a healthy animal. No wound, injury, ...om a healthy dog can produce the specific disease ...bies. Abundant proofs can be brought forward ...his assertion, and Professor Pillwax, of Vienna, ... the strongest evidence against this alarming

statement. In "Rabies and Hydrophobia" this question is more fully discussed. The ordinary vehicle of communicating the infection is the saliva or mucus from the mouth of rabid dogs, but it has been proved that unmixed saliva taken from the salivary duct portions of the salivary glands, and the blood itself, have the same properties. On these points there is an exhaustive account in the same work we have above referred to. We may then conclude with Holland and Shinkwin, that the disease may and has been transmitted:

1st. From dogs to cats, oxen, foxes, pigs, and sheep.

2nd. From dogs to foxes, and through them to man.

3rd. From dogs to cats, and through them to man.

4th. From wolves to man.

5th. From cats to other animals.

6th. From foxes to other animals.

7th. From dogs or other animals to horses, and thus to man.

8th. That the disease as it occurs in man is generally caused by dogs, wolves, cats, and foxes.

9th. That it may be transferred from man to animals, but that the evidence is incomplete of the communication of the disease from man to man. In our tables the case of Monsieur Caillard is given, who was bitten twice, and there are instances on record where wounds have been received while making autopsies without any bad consequence.

The mortality from rabies has varied in certain periods, as may be seen at a glance, from the Registrar-General's returns for England and Wales.

Statistics of Deaths in England since 1838 *from Rabies.*

Years.	Deaths.	Years.	Deaths.
1838	24	1857	3
1839	15	1858	2
1840	12	1859	4
1841	7	1860	3
1842	15	1861	4
1843	—	1862	1
1844	—	1863	4
1845	—	1864	12
1846	—	1865	18
1847	5	1866	36
1848	7	1867	10
1849	17	1868	7
1850	13	1869	18
1851	25	1870	32
1852	15	1871	56
1853	11	1872	39
1854	16	1873	28
1855	14	1874	61
1856	5	1875	47

We may mention that during the years 1838, 1839, 1840, 1841, the deaths from another disease, almost equally intractable and terrible, namely, tetanus, were respectfully 129, 122, 148, 118.

A considerable number of the deaths recorded from rabies occurred amongst children under five years of age. 231 fatal cases are reported in five years, viz., 173 males and 58 females; thus the mortality from this disease among males was just three times as great as that which prevailed among females. As regards the ages of the persons whose deaths were referred to rabies, 23 were of children under five years of age, 78 of children and young persons aged between five and twenty years of age, 87 of persons aged between twenty and forty-five years, 32 were between forty-five and sixty-five years, and 11 were persons aged upwards of sixty-five years. It thus appears, as we have shown, that persons at all ages are equally liable to the disease, although the mortality at the different groups of ages varies with the pro-

portional exposure to risk of infection. Taking into account the numbers of persons living at these groups of ages, the mortality from rabies is considerably higher between the ages of five to twenty years—a result probably in some measure due to the fact that children and young persons are more likely to provoke attack from a diseased dog than adults.

Annual Death-rate from Hydrophobia in England and Wales to a Million Persons Living, 1838–1876 (*kindly furnished for the* MEDICAL PRESS *Reports by the Registrar-General for England*).

Year.	Deaths to 1,000,000 Persons living.	Year.	Deaths to 1,000,000 Persons living.	Year.	Deaths to 1,000,000 Persons living.
1838	1·6	1854	0·9	1866	1·7
1839	1·0	1855	0·7	1867	0·5
1840	0·8	1856	0·3	1868	0·3
1841	0·4	1857	0·2	1869	0·8
1842	0·9	1858	0·1	1870	1·4
* *		1859	0·2	1871	2·5
1847	0·3	1860	0·2	1872	1·7
1848	0·4	1861	0·2	1873	1·2
1849	1·0	1862	0·5	1874	2·6
1850	0·7	1863	0·2	1875	2·0
1851	1·4	1864	0·6	1876	1·2
1852	0·8	1865	0·9	1877	—
1853	0·6				

* The causes of death were not abstracted for the four years 1843–46 inclusive.

Metropolitan Mortality from Rabies.

The Registrar-General recorded the fourteenth fatal case of this disease registered in London since the beginning of this year, whereas the corrected average number of fatal cases in London during the last ten years has not exceeded

four. Of these fourteen fatal cases, one was of a child aged under five years, four occurred between five and twenty years, six between twenty and forty, two between forty and sixty, and one was of a person aged upwards of sixty years. The age distribution of these recent metropolitan cases does not materially differ from that of the cases registered in the whole of England and Wales during the five years 1871–75, excepting that in London the rate of mortality between twenty and forty years is greater than in the preceding group of years—five to twenty.

Deaths from Hydrophobia in Ireland during each of the years, 1838–63, *as returned on the Decennial Census Forms in* 1841, 1851, 1861, *and* 1871, *and during each of the years* 1864–75, *as registered under the* 26 *Vic. cap.* ii. (*kindly furnished for these Reports by the Registrar-General for Ireland*).

Years.	Deaths.	Years.	Deaths.
1838	3	1857	7
1839	2	1858	4
1840	3	1859	9
1841	4	1860	4
1842	7	1861	5
1843	6	1862	8
1844	7	1863	8
1845	4	1864	7
1846	4	1865	5
1847	4	1866	4
1848	5	1867	4
1849	11	1868	3
1850	5	1869	2
1851	6	1870	1
1852	2	1871	—
1853	9	1872	—
1854	6	1873	—
1855	7	1874	—
1856	4	1875	1

Deaths in Scotland.

Our returns from Scotland are very significant and important. They show how comparatively rare the disease is

in that country, for which there must be an assignable cause, and they also prove the necessity of more ample evidence, before a death shall be registered as due to rabies. The subsequent investigation which enabled the Registrar to correct the diagnostic error must have involved time and trouble, and it would have been preferable if there had been proper machinery for the same purpose during the patients' lives. These returns conclusively confirm our evidence, and render our suggestions more valuable, in reference to the necessity of ensuring a correct diagnosis in every supposed case of rabies.

We have already shown how this may be effectually secured.

Mr. William Robertson, Superintendent of Statistics for Scotland, kindly and specially reports to us that during the years 1855 to 1874 inclusive, there were only three cases of hydrophobia registered in Scotland, and of these two were certified on medical authority. Of the certified cases one occurred in the county of Perth in 1856, and another in 1870 in the county of Forfar. The third case, which was uncertified by any medical attendant, occurred in 1857 in the county of Lanark.

There were provisionally registered under the heading of hydrophobia the following cases, which after investigation are now placed under their true headings :

A case of malignant pustule occurred in 1855 ; five cases of snake-bite in various years ; in 1860, three deaths from glanders ; and in 1862, another death from the same cause. In 1871 there occurred three deaths in Glasgow, and one in Kincardineshire, of which three were attributed to glanders, and one to farcy.

When we consider the rapid increase since 1862, when there was only one death from rabies in England, and the high death-rate in 1874 (61), our readers will agree with

us that it was time something was done to inquire into the cause of this excessive loss of life, though small in proportion to the population. Rabies is a preventible contagious communicable disease.

Though we are now reviving the subject, we must remember its importance has not been neglected by our predecessors, but as Cassandra in vain warned the Trojans of their impending danger, so veterinarians—as Fleming—vainly prognosticated an increase of this affection, unless there was an efficient surveillance over dogs. Railway protection reform, it is said, would never be instituted, unless a few directors were smashed in a collision; and it seems that almost a panic was necessary to stir up public attention to the question. We hope to show, as far as possible, the causes of this increase, and the preventive measures necessary to remedy the evil, for remedied it must be.

There are many interesting points yet to be solved. It will naturally be asked, as it was asked in 83 A.D., why the canine poison, when introduced, continues operating, or germinating, or circulating in this way so many days, or weeks, or months, before it produces the symptoms and develops rabies.

Incubation is one of the most difficult points in this question, and we shall treat of it in a special chapter, and see how far modern medicine has thrown light on the older views, some of which were very simple and rational. One instance we may quote in reply to the above query. Berkenhout was of opinion, that in this it differs from other inoculated poisons, only in point of time. In all inoculations there is an intervention of some days between the cause and effect; but why that of canine madness requires a longer time for assimilation and maturity must remain a mystery, until we are better acquainted with Nature's *modus operandi*.

Probably there are other contagious diseases, whose malignant miasmata may be equally slow in their progress from

admission to efficiency. How far does this view coincide with the contagion of phthisis? the slow development of syphilis? the dormant state of cancer?

Berkenhout continues, and tells us that some attempts have been made to discover the nature of this poison, by the help of microscopes and chemical research, but to no purpose, and that all we know of the matter is that it is a poison *sui generis*, which, being absorbed by the lymphatics, produces its deleterious effects in the human body.

As Dr. Lipscomb remarked in 1809, when the infection has been conveyed into the system, the progress of the disease is extremely uncertain, all the varieties of constitution and the idiosyncrasy of every individual having a tendency sometimes to accelerate, and sometimes to retard or prevent the occurrence of rabid symptoms. In calculating the number of persons who being bitten, escape disease, we must remember that as there are certain conditions of the body which resist other diseases, so there are states of the constitution when the influence of this poison is not felt, so that independent of the value of preservative measures, Nature has generously afforded her own protection to probably a large number. We may leave, then, the subject of incubation, and all the other questions that will necessarily spring from it, and proceed to rabies, its symptoms and diagnosis.

The older writers have described it. Cælius Aurelianus, who collected his history of the malady from Eudemus, Soranus, and other writers, with whom we are little acquainted, tell us that rabies is immediately preceded by extreme irritability, unusual motions of the body, disturbed sleep, or absolute wakefulness, indigestion, stretchings, yawning, nausea, imaginary notions of bad weather, and no appetite for drink. To these symptoms, according to the same author, succeed, when the rabies begins, a desire to

drink, with terror at the sight, sound, or name of water; the patient is afraid even of fomentations with oil; his pulse is dense, small, and irregular; sometimes a small degree of fever, convulsive motions of the stomach, spasms in the pericordia, numbness of the joints and torpor of the intestinal canal, frequent inclination to make water, trembling and catching of the limbs, voice hoarse, resembling the barking of a dog; spiral posture of the body, like that of a dog lying on the ground; anxiety when any person enters the room, as if apprehensive that he should bring water; redness of the face and eyes; body emaciated, the superior parts pale and sweating; *veretri frequens tensio, cum seminis involuntario jactu.* To the symptoms above-mentioned, Boerhaave adds the following: Lassitude, weight, and indolence in every muscle of the body, disturbed sleep, frequent startings, frightful dreams, convulsions, constant inquietude, depression, sighing, and love of solitude. If the patient be bled, the blood exhibits no morbid appearance. He now complains of a squeezing about his heart. He is terrified not only at the sight of any fluid, but even of any pellucid or reflecting body. He vomits viscid bilious phlegm, or poracious bile; grows hot and feverish. To a gradual exacerbation of these symptoms are now added a dry projected tongue, open foaming mouth, extreme thirst, an irresistible inclination to spit at and bite those that are near him; cold sweats, complete rabies, and on the fourth day the patient dies.

Dr. Mead copies Boerhaave without any material alteration, except in saying that death relieves the patient in two days after the first symptoms of rabies. The descriptions of the symptoms in individual cases have been very varied, and as Lipscomb points out, it has been said, perhaps by way of apology for the inconsistency and contradictions manifest in the accounts of this disease, that there are scarcely two in which the symptoms perfectly agree. The

remark is equally true and puerile, for neither are there two human bodies alike; nor are the symptoms of any other disease in exact agreement in different persons (Fordyce). In reference to the wound, there is the greatest diversity as to its appearance and as to its healing, and Lipscomb's remarks on this point nearly correspond with modern observations; he informs us, that notwithstanding the violent effects which occasionally follow the bite of a mad dog, the wound is generally not more difficult to be healed than any other lacerated wound of the same part.

In a few weeks, or even a few days, extensive injuries have become cicatrised under the ordinary method of dressing, and even by the least skilful hands; neither pain, swelling, excessive soreness, nor any other indication of malignity supervening; and after they have been thus healed, they have remained perfectly well during the life of the wounded person, unaltered by or at the time of the subsequent rabies. This observation is justified by abundant experience, and it should operate as a caution to those who, relying on the description of the disease given by inexperienced persons, expect to see the cicatrix of the wound always become inflamed, hard, elevated, or ulcerated at the approach of rabies. On the other hand, there have been instances in which the wounds resisted every application, and for a long time constantly discharged a fœtid sanies very copiously; but sores so evidently tainted with malignity ought never to be permitted to remain for a simple hour uncauterised. It sometimes happens, indeed, that the wound, after having been regularly and perfectly healed, assumes an appearance of inflammation; as a pricking pain is felt in it, and it is surrounded with reddish or livid spots. Sometimes streaks run up the limb, and are sore when touched, and in other cases the wounded part becomes hard and swollen.

In reference to the supposed "hydrophobia," there has also been great diversity of opinion, but the majority of writers agree that the name is a misnomer, conveying a false idea. Without going farther back than 1783, Berkenhout tells us the disease is commonly but improperly called the "hydrophobia," or dread of water. He says improperly, because this aversion to water, or to drink of every kind, is only one symptom of the disease in question, and that not constantly nor exclusively; for there are many examples on record sufficiently authenticated of this symptom, this hydrophobia, in patients not bitten by a dog or any other animal. He further says:

"I am even inclined to assert that the hydrophobia is not generally a symptom of the disease produced by the bite of a mad dog. It rarely happens that the patient has any aversion to water or other liquid, until by experience he finds an insuperable difficulty in swallowing. He then dreads the approach of water, having already found that the attempts to swallow any liquid produce a violent and painful convulsion, so that the symptom in question is rather a real difficulty of swallowing liquids than any dread of water. As far as my own experience reaches, I can with great truth aver that I have never yet met with a single patient who expressed any aversion to the sight, sound, or mention of water, until he had found by experience that drinking gave him pain."

Jesse Foot, who wrote in 1788 a pamphlet advocating excision of the bitten part, also says: "Dr. Mead hath remarked, and with strict propriety in my opinion, that the word does not convey the true meaning of the effect of water upon the patient, when the frightful symptom is upon him, which is not a dread of water, but despair of gratifying thirst, through the impossibility of swallowing it."

These older observations correspond with those of modern observers. There is not dislike to water as water *per se*, or fluids as fluids *per se*, but consciousness being retained, and reflex excitability so exalted, the mental action, roused by the sight of water desired, but which cannot be swallowed, excites the distressing symptoms and spasms of the muscles of deglutition, whence the name which it has so long possessed.

Here we have a difference between rabies in man and the lower animals. Dogs and wolves drink water with avidity. This is noted by Sauvages, "Constat repetitâ apud Gallo-provinciales experientiâ, canes luposque rabidos bibisse, manducasse, flumen transisse, ut olim Marologii et bis Forolivii observatum, adeoque nec cibum nec potum aversari."

We have mentioned these old opinions to do justice to the older physicians.

As Lipscomb observes, the form and character of the disease, however, are so well ascertained, that a moderate portion of sagacity will be sufficient to discriminate between its regular and ordinary course and those adventitious symptoms which sometimes depend upon constitutional peculiarity.

Dr. Holland, as we mentioned in a previous chapter, collected notes of 120 cases. He has analysed the symptoms, and before giving our own description, we have made an abstract of his analysis, so as to afford a standard of comparison with our own.

He informs us that authors reckon the first stage from the occurrence of the first symptom to the time at which the horror of liquids presented itself. The propriety of making this division will be presently considered; but presuming for the moment that it is correct so to subdivide the disease, the symptoms in this stage are, once in every four cases, pain in the wound

and adjacent parts, which become inflamed, or redder than natural; eight in every twelve cases, present—shiverings, sadness, anxiety, sleepiness, sighing, or loss of appetite; whilst in the remaining four (of these twelve cases), pain in the wound would have occurred once as the only symptom of this stage; and in the still remaining three cases, horror of liquids would have been the first deviation from health. Hence the first stage would have been entirely absent in one out of every four cases. It is therefore evident that the division made by authors of a first, and second stage, after the occurrence of the first symptom, is purely artificial, and not supported by fact.

There exists, then, but two periods in this disease; first, that of incubation, which we have yet to consider; and second, the period of development, including all the phenomena occurring, and time elapsing between the first symptom and the death.

The development of the disease is marked, as has been just stated, by pain in the wound; this occurs once in every four cases, or the parts become inflamed, or redder than usual once in every twelve; while this symptom is altogether absent, the cicatrices remaining perfectly healthy in more than a third of all cases; to this follow shiverings, sadness, anxiety, sleepiness, sighing, or loss of appetite, twice in every three cases; then horror at the sight, sound, or mention of fluids; or in extreme cases, of anything connected with them; inability to attempt, or incapability of swallowing fluids, though the individual endeavours to take them, with occasional difficulty in taking solids, occurs most invariably; as in one case in which the patient had not any horror of liquids, could even plunge her hands and face into water, and keep water in the mouth without difficulty; yet it was impossible for her to swallow it. Hence a case cannot be considered to come under the term "hydrophobia,"

or to result from the bite of a rabid animal, in which the patient had neither horror of, or difficulty in swallowing fluids. The first consciousness of horror of liquids, or difficulty in swallowing, has often occurred, on the patient's endeavouring to satisfy an unusually severe thirst, which latter became a marked symptom in one of every eight cases. To this, spasm of the muscles of the throat, and occasionally of the face, followed four times in every fifteen cases. Nausea or vomiting occurred in three of every seven cases, while hurried respiration, oppression, dyspnœa, suffocative attacks, following the sight of fluids, or attempts to swallow, and often occurring even spontaneously, formed a symptom in two of every three cases, with a brilliant, wild, or haggard expression of the eyes, presenting itself seven times in every eighteen cases. General convulsions, alterations in hearing, feeling, and vision, occurred frequently all about the same time, in the proportion of seven to every eight cases of the first, one in six of the second, seven in fifteen of the third, and five in eleven cases of the last-mentioned symptom. The saliva begins to be secreted in increased quantity, at or about the time when these phenomena are well developed, and pours from the mouth, or is frequently spat out, in five out of every six cases. Delirium occurs about the same time, eight times in every twelve, and soon assumes a more or less furious character in the proportion of three to these twelve cases. The pupils become dilated five times in sixteen; contracted once in every thirty, eyes injected once in twenty, imperfect vision once in one hundred and twenty cases. Lastly, alteration of the sexual desires, as by priapism, ejection of semen, and once by the lustful character of the delirium, occurred once in every eight cases.

When a convulsion of a more protracted and terrific character than any of the former, producing asphyxia nine times in thirty-seven cases; either that or col-

lapse, once in every thirty, or coma once in forty cases, terminated a scene in which medicine can do naught but deplore her weakness, and lament that she is unable to check the course of a disease which leads with rapid strides to the grave.

THE SYMPTOMS.

The period of latency or incubation varies, as we have said, considerably. The wound may heal or may not heal, and the person bitten may pursue his or her ordinary avocation until the time premonitory symptoms occur, intimating the development of the disease. Virchow divided it into several stages, the first, consisting of general and special manifestations. There are feelings of *malaise*, uneasiness, restlessness, loss of appetite, stiffness about the neck and throat, pyrexia, nausea, vomiting, headache, and excitement. But these symptoms are not always present, for the patient often suddenly develops the difficulty of swallowing liquids so characteristic of the disease. The local symptoms are sometimes present, sometimes absent. There may be irritation of the cicatrix in the neighbourhood of the bite accompanied by shooting pains of the character of chronic rheumatism; this symptom being one of the most persistent.

The cicatrix may become red, swollen, or inflamed, and, if unhealed, may assume an unhealthy appearance, discharging a thin ichorous fluid. The *morale* is changed, patients become depressed, lonely, quieter, and listless; some are anxious about the bite, others endeavour to dismiss it from their memory. Many are usually irritable and ill-tempered. As Poland remarks, there often ensues a characteristic anxiety, attended with pain in the præcordia, and sense of weight and pressure on the chest. There is disturbed and broken sleep, the patient suddenly starting up in frightful

dreams; often sinking back into mental depression, and becoming apprehensive and gloomy. The generative organs are sometimes excited, inducing priapism and seminal ejections. There is loss of appetite and no desire for swallowing, a feeling of clamminess, sighing, and oppression of breathing, with unusually deep inspirations. The voice is rough; there is a sense of languor and lassitude, great weakness and heaviness; sometimes slight convulsive twitchings about the face and extremities; the heart's action is strong. This description is based upon Poland, Tanner, Fleming, and some of the best writers, besides the descriptions afforded by individual authors who have had practical experience of the disease. In fact, one description is the copy of another.

The second or actually specific stage is that of irritation, dread of drink being its chief character. It generally follows after the premonitory stage, but in some cases it may become developed at once, so rapid and sudden, as to take place without any preliminary manifestations.

It is ushered in with stiffness of the muscles of the throat, jaw, and root of the tongue, pains in the epigastrium and diaphragm, chilliness, and drowsiness. Next, there is hyperæsthesia of the eighth pair of cerebral nerves, as evinced by the convulsive spasms of the muscles of deglutition, rendering every attempt at swallowing difficult, and causing severe paroxysms. Hence the great dread of solids and fluids, and the subsequent dryness of the mouth and throat, with distressing burning thirst which cannot be quenched; the spasms extend to the muscles of the larynx, inducing hurried respiration, and a sense of suffocation; the voice is changed and hoarse, the secretions of the mouth and fauces, which were at first frothy, become now viscid, and can only be expelled with difficulty, causing a hawking and barking noise in the effort; the convulsive spasm afterwards involves

the muscles of the general system through the spinal and cerebral nerves, inducing convulsions, which may resemble tetanus and epilepsy, and may last from ten to twenty minutes. The thirst recalls the lines of Celsus (Liber v., cap. 27): "*Miserrimum genus morbi; in quo simul æger et siti et aquæ metu cruciatur; quo oppressis in angusto spes est.*"

There is flatulency and vomiting of a dark-greenish bilious fluid; the micturition is frequent, and in later stages the urine is passed involuntarily; the senses are rendered morbidly acute, the surface of the body irritable and readily acted upon by the slightest gust of air, even the feeling of the pulse, inducing an accession of the convulsive paroxysm; the sight or sound of fluids cannot be borne, as aggravating the attacks; sometimes even the smell of particular things will do so. The mind becomes in a frightful state of anxiety and alarm; there is a fear of even their best friends, and of being left alone; there is no comfort or consolation, but indescribable despair, and sometimes entire loss of control, exciting rage. Cælius Aurelianus noted this hyperæsthesia, and cautioned practitioners when bleeding such patients to prevent the sound of the blood being heard by them—*ne sonitu perculsi commoveantur.* Trousseau mentions a case of exalted sensibility of the nerves of scent. There is no sleep, and the patient is often talkative and verbose. The mental disturbance may be very slight, but on the other hand, attended with temporary rabid impulses and delusions, sometimes causing an inclination to bite. The features present a wild sparkling appearance; the brows contracted, the eyes staring, the angles of the mouth contracted, and an intensely haggard and anxious aspect. As the disease progresses, the paroxysms increase both in frequency and violence, and are oftentimes attended with great cerebral excitement, bordering upon wild maniacal fury; the

duration of this stage may last from twenty-four to forty-eight hours; it is generally short and severe. In rare instances the patient gives way to wild fury, he roars, howls, curses, strikes at the persons near him, and breaks or tears anything within his reach, after which exhaustion follows, from which he is roused by another paroxysm.

The third or paralytic stage is the decline and last moments of the disease. It is attended with rapid depression and nervous exhaustion, intermission of the paroxysms, incoherency and delirium; there is great emaciation, the mouth remains open, and the saliva runs out, or else passes back into the throat, causing a gurgling noise, and the urgent attempt to swallow or spit it out induces a choking sensation. (Poland.) The vehemence with which the patient spits out, in the earlier stages of the case, is to a bystander one of the most striking phenomena, though towards the end the jaw appears sometimes partially paralysed. (Fleming.)

The pulse becomes small, quick, and irregular, the skin bedewed with clammy sweat, the eyes dull and sunken, and the pupils large, and death takes place either from asphyxia during one of the convulsive attacks, or from exhaustion. The patient, however, may die quietly, sinking into a state of repose, with abatement of all the symptoms; in one case being able to eat and drink, and expiring immediately on suddenly waking. The duration of the disease throughout its whole course varies from seventy-four hours to six or seven days; death generally occurs on the second, third, or fourth day. It has been fatal in sixteen hours.

DIAGNOSIS.

The symptoms are so characteristic that it should not be confounded with any other disease. The chief difficulty lies in the somewhat similar character of tetanus, but from our

differential table, in chapter the third, pages 84, 85, the distinguishing features are very marked. In order to render the diagnosis clearer, we may point out other differences, as shown by Drs. Holland and Shinkwin, who also recognised this possible source of error.

1. Tetanus results from injuries of the most varied character.

2. The effects follow in a very short space of time, a week seldom, if ever, elapsing between the injury and the development of the symptoms; while the shortest interval between the bite and first symptom of rabies was 12 days, the longest 334 days, and the average 61 days 18 hours in the 120 cases collected by Dr. Holland.

3. That anxiety, horror, dyspnœa, or convulsions at the sight of fluids, form no part of the symptoms included under the term tetanus.

4. That in tetanus some of the muscles are often in a state of continuous rigidity, and the convulsions occur at much shorter intervals than in cases of rabies.

5. That delirium is a very rare symptom in tetanus, and a frequent one in rabies, occurring 80 times in 120 cases.

6. That in tetanus the secretion of saliva is seldom increased.

7. That in tetanus the muscles of the lower jaw are frequently in a state of continued tension.

8. Opisthotonos or emprosthotonos often terminates the case.

9. As Fleming remarks, physiologically while tetanus is a disease of the true spinal system of nerves, rabies involves the brain also, as evinced by the disorder of intellectual function, and special sense, even early in the disease.

In the nervous affections with which it may be confounded,

we must consider the temperament and sex of the patient, and examine the symptoms collectively, when the diagnosis will not afford much difficulty. As regards mania, in which we have sometimes an aversion to liquids manifested by the patient, we must also bear in mind the general characteristics we have sketched, when the distinction will become apparent.

We do not apprehend there will be any danger of mistaking inflammatory affections of the throat, larynx, or certain diseases of the brain.

As regards pericarditis in the form described, auscultation will reveal the distinction.

Œsophagitis may present some difficulties, but the differential table we give from Holland* will point out the essential points of difference :

In Œsophagitis.	*In Rabies.*
1. Pain in the pharynx, throat, or along the spine, occurs as the earliest and invariable symptom.	1. Pain in the pharynx, throat, and along the spine, occurred in 42 out of 120 cases, or about once in every three cases, and not as the earliest symptom.
2. The attempt at swallowing solid food causes intense pain, and in aggravated cases swallowing of even fluids is accompanied by pain, or may be totally impossible.	2. The attempts to swallow fluids, though not generally accompanied by intense pain, causes dyspnœa, convulsions, etc., while solids can be in most cases taken with comparative facility.
3. Horror of fluids reported to have occurred in one case.	3. Horror of fluid, the most prominent symptom in 119 out of 120 cases.
4. The amount of difficulty	4. No direct relation exists

* Holland and Shinkwin. *Loc. cit.*

in swallowing is in direct proportion to the extent and intensity of the pathological appearances found in the œsophagus.	between the pathological state of the œsophagus as shown after death, and the intensity of the dysphagia.
5. Saliva abundantly secreted, expectoration difficult, and the time of the occurrence of these phenomena is not fixed.	5. Saliva secreted in great quantity, often flowing spontaneously from the mouth, and these symptoms always occurring among the last phenomena.
6. Urgent thirst in perhaps all cases.	6. Thirst was urgent in about one-third of the cases.
7. Average duration of the disease, seven days.	7. Average duration, seventy hours and forty-eight minutes, or nearly three days.
8. Generally terminating in recovery.	8. Invariably terminating fatally.
9. Death caused by œdema of the glottis, gangrene, or rupture of the œsophagus.	9. Death most probably resulting from asphyxia, coma, or collapse.

Fleming assures us it is not possible to mistake rabies for any other malady, or to doubt its existence when present; for if, during the stage of incubation, doubts and fears may exist, all uncertainty comes to an end when the disease really appears. The muscular debility complained of in many cases, the restless sleep out of which the patient starts up, his continual fidgetiness, his suspicious breathing, his sadness, and thirst after pleasure, and then his love of solitude, must awaken terrible fears in the physician : especially if there be no moral causes or organic lesions to satisfactorily account for these symptoms. The intense thirst, and general muscular pains and rigors, which might at first be ascribed to some grave febrile affection, are followed by a symptom that is almost pathognomonic of rabies, namely, a sudden difficulty in swallowing liquids, water in particular. When

there is complete inability to drink, and when this dysphagia is immediately succeeded by tremor, on the patient carrying some liquid to his lips, all illusion is dispelled, and it becomes clear that he is under the fatal influence of the virus of rabies.

CHAPTER VI.

INCUBATION, FREQUENCY OF TRANSMISSION, AND OTHER KINDRED SUBJECTS.

THE most varied opinions prevail as to the period intervening between the bite and the occurrence of the disease, as to the cause of the latent action, and as to the intermediary process both in the part and in the system. It is evident that it is longer in producing its effects than any other known animal poison, and this peculiarity has excited the greatest interest, not only amongst modern, but ancient writers.

We recognise the difficulty of explaining the latent or dormant period, but we are reminded of what occurred to a great anatomist, who tried to discover the peculiarity of organic structure which disposes one man to catch small-pox, while his neighbour escapes.

In 1853 Langenbeck devoted himself to this inquiry, and on its conclusion he said :

"I have cut up more human bodies than the Old Man of the Mountain, with all his accomplices, and speaking only of my primary object, I must confess that I am no wiser than before ; but though the mystery of small-pox has eluded my search, my labours have not been in vain; they have revealed to me something else."

Though we do not aspire to solve the incubatory problem,

and can only advance theories or good working hypotheses, yet we, by a large number of facts, hope to arrive at definite conclusions in reference to the average time between the bite of the animal and the development of rabies.

We shall begin with the older writers and their opinions.

Dioscorides * says it has no certain time of attacking people; it generally comes on in about forty days, but in some cases, not until after six months, or even a year, but he observes there are writers who assert that persons have been attacked after seven years.

Galen† relates that he saw the occurrence of rabies more than a year after the bite was inflicted.

Paul Ægineta‡ states that it usually comes on about the fortieth day, but in some cases not until six months after the bite.

Varignan§ asserts that the poison remains latent frequently for a year, but in some constitutions is productive of the disease in four days, a week, or a month, or six months.

Fernelius|| remarks that the bite of a mad dog seldom produces the effects before the twentieth day, but in some cases it is a year before the symptoms take place.

Ambrose Paré¶ was of opinion that the same poison, in the same weight and measure, given to different men, of different constitutions, will kill one in an hour, another in six hours, or in a day, and, on the contrary, will not so much as hurt a third person.

Vander Wiel** particularly notices the circumstance that

* *Dios.*, lib. ii. c. 12.
† "Comment," 2, tome viii. p. 735.
‡ "Comment," lib. 5, c. 3.
§ Varig. Tract., iii. p. 127.
|| "De Morbis Cont.," lib. ii. c. 14.
¶ Ambrose Paré, B. 21, p. 505.
** *Observ.*, No. 100, p. 431.

persons bitten at the same time, and by the same animal, become affected at very different periods.

Claude de Choisel speaks of thirty days after the bite as the usual period. Dr. Mead* agrees with this.

Lommius† tells us that the disease has been observed in fourteen and forty days, and after six and seven months. Morgagni ‡ refers to a case in which twenty years were said to have elapsed. Webster, § Hamilton, and Boerhaave ‖ seem to have copied from Morgagni, in mentioning a similar lapse of time.

The antiquity and specific nature of the disease is confirmed by the very accurate observations of the old writers, and their opinions and observations correspond in a striking manner with those of modern authors.

Holland¶ arrived at the following calculations from his summary of 120 cases:

The shortest interval between the bite and the first symptom was twelve days, the longest 334 days; the average period of incubation was sixty-one days eighteen hours.

The shortest interval between the bite and the death was fourteen days eighteen hours, the longest 335½ days, the average sixty-three days, seventeen hours, and twelve minutes. The least number of hours from the occurrence of the first symptom to death in these cases were eighteen hours; the greatest interval 201 hours, and the average duration of the symptoms was seventy hours forty-eight

* Mead "On Poisons."
† Lommii, Med. Obs., lib. i. p. 64.
‡ Morgagni, Epist. viii. sec. 21.
§ Webster, "De Magia."
‖ Boerhaave, "Aphorisms."
¶ Holland's Notes and Shinkwin's Lectures, *Dublin Medical Press*, 1865, p. 390.

minutes. Boudin * affords us the following analysis of sixty-nine cases :

In 14 the symptoms appeared in 1 month.
In 41 „ „ 1 to 3 months.
In 8 „ „ 4 to 6 „
In 6 „ „ 7 to 12 „

Tardieu, from an analysis of 147 cases, obtained the following results :

In 26 the symptoms appeared in 1 month.
In 93 „ „ 1 to 3 months.
In 19 „ „ 3 to 6 „
In 9 „ „ 6 to 12 „

Cæsar Hawkins† arrived at the following figures after an analysis of 130 cases :

In 17 the symptoms appeared in from 18 to 30 days.
In 63 „ „ „ 30 to 59 „
In 23 „ „ „ 60 to 90 „
In 9 „ „ „ 90 to 120 „

He informs us that after this, the symptoms developed at various periods, one or two in each month, the 5th, 6th, 7th, and so on, up to the 19th, the last case occurring under Mr. Nourse's care.‡ Cæsar Hawkins says : "This is the latest time at which rabies can be fairly said to have been known ; there is, indeed, a case of Dr. Bardsley, in which it is said to have been produced by a bite twelve years before, but it appears most improbable that this was really the case."

He asserted, from six weeks to three months was the time in which almost all the cases of rabies had been seen.

In reference to the case of Bardsley, Dr. Elliotson § observes that there is doubt about its genuineness. He believed

* *Encycl. Brit.*, Art. "Hydrophobia."
† Lectures, *London Med. Gaz.*, 1844.
‡ Nourse, "Philos. Transacts.," No. 445, 1737–38.
§ Elliotson, Lectures, *London Med. Gaz.*, 1833.

verage interval was from one to two months. Elliotson ...een six or eight cases in London, and mentions the in...ence of two little girls, who were bitten on the face by a rabid dog. At the expiration of from six weeks to two months the girl who was bitten second was attacked and died; but the other sister escaped.

Dr. Parry doubts the genuineness of Bardsley's case.

Lawrence * tells us there is a latent period, tolerably definite and regular, resembling somewhat that of scarlet fever, small-pox, and measles, and, generally speaking, incubation extends between thirty and forty days. He also alludes to the case published by Bardsley in the memoirs of the Manchester Literary and Philosophical Society. We may say, as rabies cannot arise spontaneously, or, to use a common expression at the present time, as it cannot have a *de novo* origin in man, the case of Dr. Bardsley, and also that reported in our tables by Mr. Macintire (Case 83), must be explained under one or other of the following hypotheses:

1. As in the face of facts and evidence, we have almost a definite period of incubation, seldom exceeding a year, we may, *a fortiori*, deny the possibility of an incubation of ten to twelve years, and consequently have recourse to a simple and rational explanation, as—

a. That the patients may have received a bite, or were inoculated, without their knowledge, at some later period.

b. As we have seen, many mistakes have been made in diagnosis by skilful and intelligent physicians, so similar mistakes were made in these reputed cases.

The returns of the Registrar-General† for Scotland prove, independent of our own, other possible sources of error, and we must therefore allow our readers to choose from one or other of the above suggested theories.

* Lawrence, Lecture, *London Med. Gaz.*, 1829.

† Vide Chapter V.

Romberg* has shown, from an analysis of sixty authentic observations, that the shortest period was fifteen days, the longest from seven to nine months, and the average period from four to seven weeks. He remarks that the same infection presents differences independent of age, or sex, or the locality of the injury, for in thirteen patients described by Trolliet, who had been bitten in one day by a mad wolf bitch, the symptoms developed in—

6 between the 15th and 30th day.
4 „ 30th „ 40th day.
2 „ 40th „ 53rd day.

And in one in three months and eighteen days after the bite.

Fleming† informs us that in 224 cases noted in France—

In 40 incubation was less than a month.
In 143 „ from 1 to 3 months.
In 30 „ „ 3 „ 6 „
In 11 „ „ 6 „ 12 „

The mean duration of the latent period from Roucher's analysis of cases that occurred in Algiers, has been fifty-one days—the ordinary minimum thirty days, the maximum three months.

Fleming‡ furnishes us with Bouley's statistics of 129 fatal cases, the period of incubation being given in 106 : in 73 rabies developed in sixty days ; in 33 up to the eighth month.

Trousseau informs us that the disease generally shows itself in man in from one to three months after the infliction of the bite ; that cases are rare after three months, and still more rare from the sixth to the twelfth month, and in his opinion, from the statistical observations we have, the au-

* Romberg, "Nervous Diseases," vol. ii., p. 144.
† Fleming, "Rabies and Hydrophobia," p. 194.
‡ Ibid.

thenticity of cases reported as occurring after a year, might be almost disputed.

Bouley concludes from his statistics that after two months, immunity may be looked for, though the danger has not entirely passed away; but the patient may, after a few more months, reasonably entertain sanguine hopes of safety.

John Hunter says, the longest period of incubation is seventeen months. We may then sum up our evidence on the facts we have.

1st. The duration of the latent stage has an indefinite, though, to a certain extent, a regular course, for the majority of cases collected, not only by English, but by foreign observers, prove that the interval has generally been from one to three months.

2nd. That age influences the incubatory period, it being shorter in young than in old people. Fleming tells us that from an estimate of ages, from three to twenty, and from twenty to seventy-two, it has been found that for the first group there was a mean period of forty-four days, and for the second of seventy-five days.

3rd. Having such an almost accurate idea of the average period of incubation, the physician, whilst not neglecting all reasonable precautions, can hold out reasonable hopes to his patient of an almost perfect immunity after three months, and an increasing hope with every month that passes, so that, after a year, he may afford a scientific certainty of the patient's safety. In other words, all reputed cases of rabies occurring after a year, must be looked upon with suspicion, and should the symptoms be simulative, other causes must be assigned, as re-inoculation, etc.

THE THEORIES ON INCUBATION.

The virus being introduced through the skin, or through any abraded surface, the natural questions suggest them-

selves: Does it remain hermetically locked up for a time? Does it produce a change in the system before the development of the symptoms? Is it a slumbering germ which may be roused into action by various exciting causes?

We have settled the fact of how rabies is caused, and we have arrived at tolerably definite ideas as to the period it takes before revealing its fatal effects; and we must now unfortunately enter the region of hypothesis, and see if we cannot arrive at some satisfactory explanation. We need not give the theories of very old writers, though they are interesting and instructive, and afford ample illustration of how difficult it is to evolve a new idea. An endless field for speculation is opened out, and we must limit our selection of the theories advanced.

Faber imagined the contagious principle became encysted on its introduction, and that it entered the blood under the influence of certain favourable conditions.

Brown Séquard is of opinion that an alteration takes place in the part of the body bitten by a rabid animal before the characteristic phenomena of rabies appeared; that the convulsions follow a kind of *aura* starting from the wound or cicatrix. He therefore lays the *locus in quo* in the wounded nerves.

This theory is negatived by the facts that the nerves have been excised, and the limb amputated without benefit after the symptoms have appeared, also by the fact that in the majority of cases, the wounded part shows no evidence of alteration.

Zanthos and Marochetti suggested that the virus was first localised, and subsequently, within a period varying from the 2nd to the 28th day, was absorbed, and formed secondary "lyssi," consisting of a pustule or vesicle beneath the tongue.

Magistel says he saw these lyssi in different individuals on the 6th, 11th, and 20th days.

Marochetti asserted that these pustules were pathognomonic; that the virus accumulates, and is temporarily retained about the orifices of the sublingual ducts, on the sides of the frænum of the tongue, and on the lower aspect of that organ. In these places several ephemeral pustules show themselves, whose fluctuation can be perceived by means of a probe. The time at which they appear is not certain, but they usually correspond to the interval between the third and ninth day after the bite, though they have been seen so late as the thirty-fourth day. If the virus in these pustules is not destroyed within twenty-four hours after they appear, it is re-absorbed, and the disease soon manifests itself. It is therefore necessary during six weeks, at least, to examine carefully, several times each day, the lower part of the tongue of a person who has been bitten.*

If the pustules appear, open and cauterise them promptly; but if they do not form, it is certain that the individual will not suffer from rabies.

Trousseau believed in the possibility of their appearance.

Romberg considered them a hoax, practised by a Ukraine peasant; the majority of observers have not discovered them.

We mentioned on a former occasion, a theory suggested in the *Lancet*, of 1827, under the name of "Mysotoxicos," which offers a reasonable explanation of part of the phenomena. That the poison is localised for a time, we know from the result of excision.

Jesse Foote,† in 1788, published a very valuable pam-

* "Aperçu Historique sur les Lysses." *Recueil de Med. Vetcr.*, vol. v. p. 658. Fleming, "Rabies and Hydrophobia," p. 169.

† "An Essay on the Bite of a Mad Dog," by Jesse Foote, Surgeon, Lond., 1788.

phlet, dedicated to Pott, on the value of excision. He reasoned from analogy, from the bite of a viper, and from experiments made on the guinea-pig, that excision would be useful before absorption had commenced. He also drew his inferences from the experiments of the Abbé Fontana, who had made 6000 experiments on the effect of the bites of vipers.

We shall have occasion when dealing with preservative measures to return to Jesse Foote again.

Dr. Anthony Todd Thompson* in his comments upon a case of rabies from the bite of a cat, in 1826, threw out the hypothesis that the virus remains dormant in the part where it is deposited by the tooth of the rabid animal, until a certain state of habit rendered the nerves in its vicinity susceptible of its influence, and this being communicated, a morbid action is begun in these nerves, and extended to the respiratory nerves, which induce the whole train of symptoms constituting the disease.

Mysotoxicos† tells us that everything leads to the belief that the virus, which has afterwards to contaminate the circulation, is generated in the wounded part from the germ first deposited there by the tooth of a dog, just as we see take place in variola, vaccinia, and syphilis, the period of assimilation being different in all these. But as soon as absorption of this assimilated matter commences, the symptoms of the disease begin to show themselves. He also says that modern and well authenticated experiments have proved that when a poison, whether mineral, vegetable, or animal, is applied to a wound, the animal is not affected until absorption has taken place, for if an exhaustive cupping-glass be placed over the poisoned part, but one minute before the expiration of the time at which the poison is known invari-

* "Medico-Chir. Transactions," vol. xiii. 1826.

† *Lancet*, vol. ii. p. 809, 1827.

ably to produce its effects, the animal exhibits no symptoms whatever. The experiments of Jesse Foote * prove that a guinea-pig might be bitten by a viper, and five minutes allowed to elapse before amputation of the part bitten was effected, when the animal survived.

Mysotoxicost also suggested, under the presumptive impression that in rabies, as well as in all other varieties of poisoning, the transport of the deleterious matter from the wound into the system, and the appearance of the symptoms followed, as cause and effect, some special precautions might be taken, even when the symptoms were pronounced.

When the cicatrix begins to feel at all tender, he advises:

1. The immediate application of a cupping-glass for an hour.

2. The dissection out of the bitten part.

3. The re-application of the cupping-glass for another hour.

Whoever this writer may be, who fifty years ago adopted this pseudonym, and whose individuality is just as much lost as that of Junius's, his views are rational; and though we cannot endorse them in full, yet they present as satisfactory an hypothesis as we can expect, on part of the phenomena. They somewhat resemble the views of Todd Thompson, which have been revived by some modern writers, as Sir Thomas Watson.

The wound in the majority of cases does not assume any inflammatory action, nor can we, by the naked eye, discover any alteration in the appearance at the time of the development of rabies.

The action of the virus seems most to resemble that of syphilis, in which we have a period of latent action, a period

* Jesse Foote. *Loc. cit.*
† *Lancet*, 1827. *Loc. cit.*

of absorption by the lymphatics, and a subsequent incubatory period of syphilisation. Further research is necessary, and experiments with the virus, as dissecting or excising the bitten part, and introducing it into some animal, and then watching its effects day by day.

Now that *bacteria* play such an important part in disease, we shall expect some results in this direction, and a further explanation of the remaining part of the phenomena.

Virchow, we know, is of opinion that the contagium of rabies has an action similar to that of ferments ;* that the new elements introduced at the point of inoculation are being continually introduced into the blood, by means of which they act on the nervous system ; and that rabies only appears when these elements have accumulated in an excessive quantity.†

As Fleming says, there may be a double zymosis, first in the part, and afterwards in the system, the result of which is either to multiply the poison, or to increase its virulency.

There are many other ingenious speculations, as for instance, whether the virus is present in the secretion of the generative organs. For man we may answer by the following statements :

Chabert relates that a female, the wife of the executioner, contracted the disease. She had cohabited with her husband up to the evening of his being attacked with rabies, due to his having been bitten by a rabid dog.

Hoffman relates a similar case ; but Baudot mentions the case of a young woman who had cohabited with a soldier

* This view is a return, to a certain extent, to an old theory, Etmullerus, in 1683, said : "The cause of this disease consists in a certain peculiar ferment, which affects first the spirits and then the blood. This ferment is carried along with the saliva into the wound."

† "Rabies and Hydrophobia," p. 167.

for a month, from the day when he had been bitten by a mad dog, until rabies manifested itself, without becoming affected.

Bouteille, Boissiere, and Rivollier, mentions cases in which sexual intercourse took place within only six hours of the appearance of rabies, without transmission.

We may dismiss this idea as only a speculation for the curious, and negative the possibility of infection by any such source.

We may summarise then, our knowledge of the theory of incubation.

The smallest quantity of the virus is potent, and being introduced, probably remains localised for a period, and probably zymosis explains the subsequent action. This action may be excited by many internal or external influences, as excitement, anger, fear, injury to the cicatrix, etc.

FREQUENCY OF TRANSMISSION.

As we have said, the majority of persons who are bitten escape, and hence the success of vaunted specifics which have been in vogue from the days of Mithridates down to the present day. No bad result can follow, as we have said, from the bite of a healthy dog, except an unpleasant injury, though every wound should be attended to promptly, and all reasonable precautions adopted. The animal which inflicted the bite should be watched, in order to ascertain accurately the state of its health ; when proved healthy, the patient will be relieved of the feeling of suspense, and will know with certainty that rabies cannot follow. Dogs will bite if they are teased, and we are apt too often to forget this. They are loving, affectionate, and much-enduring animals, but their endurance is oftentimes sorely taxed ; we have many times felt astonished that dogs have so patiently allowed their tails or ears to be pulled, and other torments

inflicted on them, without retaliation, and we cannot too strongly impress the duty dog-owners owe to these animals, of treating them with kindness and consideration. If dogs are kept for use they are valuable—if for pleasure, they are a source of enjoyment, and on either ground we should have a personal interest in their well-being; they should be regularly fed and supplied with water, and it is greater cruelty than was ever performed by any vivisectionist, to keep an animal for months in a half-starved condition. Statistics show that a large number are bitten annually without any bad results, and also that a large number are bitten by rabid animals with immunity, and that this immunity is secured by attention to the wound. The older writers, as Etmullerus,* recognised two periods of time in this affection:

1. That of receiving the first hurt or wound.
2. That of the supervening rabies.

Etmullerus also recognised that if taken at the beginning it may be cured by proper remedies.

Preservative measures will subsequently receive our attention; at present we shall confine ourselves to some statistics bearing on the proportionate number of persons bitten and the comparative mortality.

From Zurich† we have returns of 233 persons who were bitten by rabid animals in a period of forty-two years. Of this number only 4 died, 2 of whom were bitten in parts where preservative measures could not be adopted.

The Zurich plan of treatment consisted in scarification of the bite, application of pulvis lyttæ, and mercury. The wound was kept open for the space of six weeks.

Wendt, of Breslau, treated 106 persons bitten by mad animals between the years 1810 and 1823. Out of this

* Etmullerus, "Practice of Physic," 1683.
† *Med. Chir. Review*, vol. vi. p. 265, 1826.

number 2 died. He also attended 78 others who were bitten by animals not rabid.

Wendt kept the wound open for six weeks, and filled it with powdered cantharides.

Ekstrom * reported an epidemic of rabies at Stockholm, which occurred in the year 1824. The account was drawn up at the request of Henry Earle, and is interesting as Ekstrom also suggests the idea that the poison is not received into the system until a short time before the symptoms of rabies became manifest. He also starts the ingenious speculation that a portion of the poison may be detained in the original wound, in consequence of condensation of the cellular membrane.

Ekstrom affords some other interesting information, as that a patient spat into his eyes, and into those of the house surgeon, without any bad result. The only remedy employed was tepid water. The same patient bit the nurse in the hand. The hot iron was immediately applied, and she suffered no further inconvenience.

Ekstrom informs us, in the spring and summer, 1824, rabies was epidemic in Stockholm, and 106 persons presented themselves at the Royal Hospital, with wounds received from the bites of animals rabid, or supposed to be so; out of the entire number, only one afterwards suffered from the disease.

This unfortunate did not attend to his wound, and did not comply with the conditions laid down by the medical authorities. The treatment consisted of deep incisions in the wound and surrounding parts, which were then washed with water, or dilute muriatic acid, or a solution of muriate of lime. The hot iron, or *potassa fusa*, or strong muriatic acid, was then applied so as to touch every point of the bottom of the wound and incisions.

* *London Med. Gaz.*, vol. vi. p. 689.

The suppurating surfaces were kept open for weeks and months by means of cantharides ointment.

Earle, surgeon to St. George's Hospital, told Youatt that nearly 4000 persons had undergone the operation of excision at that institution, having been bitten by rabid or suspected dogs, and it was not known that any of these subsequently developed the disease.

Youatt,* as we have mentioned, was bitten himself five times; and he also cauterised the wounds of 400 persons, who had been bitten by rabid animals, all of whom escaped.

John Hunter states that he knew an instance in which 21 persons were bitten, and only 1 died. And Vaughan, another instance in which between 20 and 30 persons were bitten by a mad dog, one of whom only perished.

Aitken† states that out of 153 persons bitten by a rabid dog, 94 are said to have died.

Tardieu mentions that in 99 individuals bitten by animals manifestly rabid, 41 became ultimately affected.

Bouley‡ in his report published in 1870, has collected the histories of 320 persons bitten by rabid animals, and of these 129 perished from rabies.

According to Renault the percentage amounts to 33.

The injuries inflicted by wolves seem to have been much more serious and fatal; according to Renault, out of 254 persons bitten by these animals, 164, or nearly two-thirds, died of rabies; and Troilliet§ relates that out of 23 persons bitten by a wolf, 13 died.

In these cases preservative measures were not adopted and hence the great fatality.

* Youatt, "Canine Madness."
† Aitken, "Practice of Medicine."
‡ Fleming, "Rabies and Hydrophobia."
§ "Nouv. Traité de la rage," 1820.

The letter from the secretary of the Home for Lost Dogs, Battersea Park Road, furnishes facts which should remove the fears of nervous people. Mr. Scoborio* states that nearly 95,000 dogs have been seized in the streets by the police since the enactment of the Traffic Regulation Act. Many of these animals were more or less intractable. These animals were conveyed by hand to police stations, and afterwards to the Dogs' Home ; and Mr. Scoborio is authorised by Chief Inspector Harris, of Scotland Yard, to state that notwithstanding the great risk of rabies incurred by the officers engaged, and the frequency of severe bites, that dreadful malady, rabies, has never occurred in the metropolitan police, as shown by the medical returns. Furthermore, at the Home for Lost Dogs, where a stream of 1500 boys per month passes through the premises, and where upwards of 400 dogs are constantly kept in kennels, bites (sometimes of serious nature) are of daily occurrence ; yet not once during the last seventeen years has rabies resulted from any of such injuries. The head keeper (Mr. Pavitt) has been employed at the Home since its foundation, and has informed Mr. Scoborio that he has been bitten, more or less severely, hundreds of times, without ever feeling any symptom of madness, or any pain except natural suffering arising from the injury.

Since the establishment of the Home for Lost and Starving Dogs, 200,000 animals have been brought to the kennels. Not one of those dogs has been affected with rabies, although most of them were stray, starving, or vagabond animals. He thinks this disposes of the popular theory that the terrible disease alluded to is cherished only by stray dogs. It is important to note this point, because it proves that the cry of death to dogs found in the streets without owners is

* Letter, *Standard*, Nov. 19, 1877.

unjust and unreasonable. It is nevertheless true that many hundreds of "mad dogs," so called, have been brought to the Home, where they have been isolated, kindly treated, and fed with appropriate food. In not one instance has rabies been discovered in such animals. Some of the cases at the time of their arrival were designated as "raving madness," and stories were told of bites by the dogs which had already resulted in rabies, yet without the slightest foundation in reason. There were found symptoms of disease, but not of rabies; while proofs of alleged rabies consisted of the usual vague assertions, without verifications of any kind, so far as could be ascertained. This circumstance has an important bearing on the prevailing panic. Ignorance of the real symptoms of rabies and terror of its consequences will inevitably lead to atrocities in our streets. A fit is not a symptom of rabies, as is popularly supposed, and no alarm ought to be felt by the public when they see a convulsed dog in the street. Unfortunately, people do not stop to reason, but give way to their fears when they see such an occurrence, and the poor brute is consequently driven up one street and down another at his utmost speed, kicked, stoned, terrorised, and maddened into fury, until he bites some one obstructing or pursuing him, whereupon, without further evidence, he is pronounced to be mad.

We must ask for consideration for our friend the dog, and for our readers to calmly weigh this sensible letter. Goldsmith evidently must have witnessed, or imagined, some such panic, as we are now passing through, when he wrote the following satire, a satire so gentle, and yet so true, that probably a large number will have read it, without ever seeing its point. We need hardly make an excuse for reproducing it:

AN ELEGY ON THE DEATH OF A MAD DOG.

Good people all of every sort,
Give ear unto my song,
And if you find it wondrous short,
It cannot hold you long.

In Islington there was a man
Of whom the world might say,
That still a godly race he ran
When'er he went to pray.

A kind and gentle heart he had
To comfort friends and foes ;
The naked every day he clad
When he put on his clothes.

And in that town a dog was found,
As many dogs there be,
Both mongrel, puppy, whelp, and hound,
And curs of low degree.

This dog and man at first were friends,
But when a *pique* began,
The dog to gain his private ends,
Went mad and bit the man.

Around from all the neighbouring streets
The wondering neighbours ran,
And swore the dog had lost his wits
To bite so good a man.

The wound it seemed both sore and sad
To every Christian eye ;
And while they swore the dog was mad,
They swore the man would die.

But soon a wonder came to light,
That showed the rogues they lied ;
The man recovered of his bite,
The dog it was that died.

INFLUENCE OF SEX AND AGE AND SEAT OF INJURY ON TRANSMISSION AND MORTALITY.

We have already mentioned that the male sex appears most exposed to the dangers of rabies. The following brief statistics will still further confirm this.* In England from 1847 to 1858, 133 deaths took place from rabies—viz., 103 males and 30 females. From the Departmental Reports compiled in France, from 1850 to 1859, we also learn that the proportion was as follows: Males, 175; females, 64. In Bouley's analysis of 320 persons bitten, 206 belonged to the male, and 81 to the female sex, the sex not being indicated in the remaining 33.

Age.—We have already alluded, in the last chapter, to this subject, in connection with the mortality, and add a further contribution to it. In England, in 1866, the number of deaths being thirty-six, the ages were as follows:

Years.	Deaths.
Under 5	6
From 5 to 10	9
„ 10 „ 15	2
„ 15 „ 20	4
„ 20 „ 25	4
„ 25 „ 30	5
„ 30 „ 40	2
„ 50 „ 60	2
„ 60 „ 80	2

Boudin gives the following ages of 136 persons who died from rabies in France:

* Fleming, "Rabies and Hydrophobia."

Years.	Deaths.
Under 5	7
From 5 to 15	30
„ 15 „ 20	15
„ 20 „ 30	12
„ 36 „ 60	54
„ 60 „ 70	8
„ 70 upwards	6

Bouley gives the ages in 124 cases, from which we find that the largest number of accidents, 97 out of 174, occurred between the ages 5 to 15.

Children, we know, thoughtlessly and imprudently play with animals and tease them, and even with strange dogs they are inclined to endeavour to make friends.

Seat of Injury.—Statistics afford ample evidence that bites inflicted by rabid animals upon uncovered parts of the body, such as the face and hands, are much more disastrous than when the teeth have had to penetrate the clothing.

Wounds on the face, especially, seem most dangerous; hence the mortality from the wounds of rabid wolves which generally fly at the face of those persons whom they attack. French statistics on this point are almost conclusive.

In forming our prognosis, we shall have to consider such circumstances, as the nature of the animal, the structure of the teeth, the size of the wounds, number, extent, and depth, as well as the nature of the parts involved. These shall receive more extensive consideration when we are speaking of the preservative measures necessary in every case, where the bite of an animal has been received. We now leave the theoretical, and must next consider the practical questions: when the diagnosis of rabies in the human being is clearly established, can we hold out the faintest hope of recovery, or must we, as Romberg says, advise the patient to make "meditationes mortis?"

As "heirs to all the ages," with the wealth of medical literature we possess on this subject, with the accumulated experience of some thousands of years, with the facts and evidence we have collected, must we confess that medicine is impotent, and a case of recovery has never been recorded?

Can we only endorse the opinion that death is the physician that cures, *ἰατρὸς ἰατρὸι θάνατος*, and we can only promote the patient's euthanasia, in a manner certainly more scientific and more humane than the smothering practices of our ancestors—that our only resort is to poison the patient, *cito tuto et jucunde*, by chloroform or chloral hydrate?

We must emphatically assert, cases of recovery have been recorded, and have taken place; that the evidence on this point is as conclusive as the evidence that such a disease as rabies exists; and to deny the existence of such records of recovery, is simply to deny the existence of the disease. We can only know rabies by the symptoms, and by the description we have furnished by those who have had cases under treatment.

If the evidence is satisfactory and conclusive that rabies has existed, and, unfortunately, been too fatal, it is also equally satisfactory and conclusive that Dr. Offenberg has described the disease, and attended a patient who recovered, and that Dr. Austin Flint has offered similar testimony.

We are not enthusiastic on the subject of the efficacy of *curara*; but we feel it our duty, with the utmost deference, to enter a protest against statements which are not verified by fact, and which strike at the root of medical progress and medical science. The injurious tendency of such teaching we have had already occasion to animadvert on, and we have attributed much of our ignorance on the subject of this disease to the influence exercised by some of the older physicians. We have demonstrated how much progress has been made even since 1870 in the morbid anatomy and

pathology, and this alone should be an inducement to encourage further research.

We have shown how much we know, how much we have yet to learn; we are willing to acknowledge our ignorance on many points, but we cannot admit the impossibility of discovering a remedy, and we are not disposed to write over the door of the patient's room the despairing and well-known lines of Dante:

"Lasciate ogni speranza."

The treatment in the past has been, in the majority of cases, irrational and unscientific; the majority of the deaths may be attributed as much to the bad treatment and the action of the medicine administered as to the virus introduced into the system. Encouraged by the recoveries that have taken place, we venture to prophesy future successes, if not with *curara*, still with some other remedy, wrested by the skill of the scientist from the grand laboratory of nature. We believe there is not a poison in existence for which there is not an antidote. We have faith in our profession, a faith not resting on the changing quicksands of medical theories or opinions, but built on the sterling triumphs of medicine over diseases which were pronounced by our ancestors incurable.

We cannot recognise, then, in rabies any special conditions which preclude us from hoping that the beneficence of the Creator, which enables us to grapple with other diseases, will grant us similar power over this sad scourge of humanity; and in this spirit we lay before the profession our views on treatment, curative, preservative, and preventive.

CHAPTER VII.

TREATMENT: CURATIVE.

From our statistics it will be seen that almost every known remedy has been tried, and a re-enumeration of all the medicinal agents, and all the methods of treatment resorted to, from the days of Celsus up to the present time, is thus rendered almost unnecessary. As Fleming so well tells us, in the early and middle ages, magic, innovations, exorcisms, appeals to supernatural powers, and charlatanism of the grossest character had to give way to the fatality of the disease.

Bleeding in every degree, mercury, opium, and other cerebral stimulants, chloroform, tobacco, the acids and alkalies, oil of turpentine, cantharides, tar, white hellebore, ceradilla, the salts of lead and those of iron, nitrous oxide, inhalations, the injections of warm water and narcotics into the veins, electricity and galvanism, the hot vapour and hot air baths, even the poison of the viper, have all been tried, and with the same sad results.

Cases of recovery have been recorded, as may be seen from our tables, but the same treatment, when employed in other cases, has unfortunately failed.

But these instances of recovery, however, as we said in our introductory chapter, should inspire us with confidence in the resources of medicine, and should lead to a rational

mode of treatment, especially as we have proved that we have a clearer and more rational comprehension of its pathology. We cannot, then, abandon to their fate those who exhibit indications of the disease, and in the face of our evidence we need not any longer perpetuate the error, that it is infallibly mortal. The time has not long gone by, since, because of the supposed inevitable death of the patient, and the horrible sufferings undergone before dissolution, human beings were destroyed by suffocation, instances of which we shall give in our chapter on the curiosities of the medical literature of this disease. But we are emerging into a clearer light, and we have at the present time some confirmation for our opinion, that the remedy for this disease may probably be at hand. In our issue of June 13th, 1877, we said in the face of so incurable a malady, which has taxed all the resources of the materia medica, and which carries off so quickly and so terribly the unfortunate subjects who are bitten, it was pleasant to record a case of recovery.

We also said, enthusiasm about new remedies was not wise, as but lately another alleged specific, the Xanthium spinosum, recorded in the same number, had not maintained its reputation.

The remedy used was curara, and we observed that one single case did not prove anything, but that the physiological character of curara reasonably encouraged us to make further experiments with it.

We were then aware of the history of the woorali poison, and of the antecedent efforts made not only by English medical men, but laymen, to use it as a remedy ; but unfortunately this had not been done in the past, nor at the present time can we say with certainty that the woorali is a specific, though we have the gratifying assurance of two successful cases, treated by this remedy and recorded in our own pages. It must be tested scientifically, and

under the conditions we shall lay down, by some competent observers; and with the data we have, we may reasonably hope that by its judicious application rabies may be shorn of its terrors.

We have shown in various portions of our report that there was a shadowing forth in the past of some of the truths in regard to rabies, and that some of the older physiologists had undefined though, it has been proved, accurate ideas of its pathology. If the curara should maintain its position, it will again illustrate that we have been forestalled. To a member of the veterinary profession we are indebted for the merit of recommending curara in cases of rabies.

Professor Sewell was the first who suggested the idea, and Waterton who went in quest of the poison, and acquired it in its pure state at his own expense, and at the cost of his own health, has generously given him the credit of the suggestion. Sewell, on the authority of Waterton, is said to have declared before Sir Joseph Banks, and a large company of scientific gentlemen, that, were he unfortunate enough to be bitten by a mad dog, and become infected with rabies, he would not hesitate one moment in having the woorali poison applied, as he felt confident that the application of it would prove successful.

The history of this poison is most interesting, and we must linger for a short space on it.

Taylor, in his classic work on "Poisons," quotes Waterton's account, and this offers us some guarantee of the veracity of the much-abused naturalist. We shall give an abridged account from the original work, from the folio edition, 1825.

In the month of April, 1812, Waterton left the town of Stabrock to travel through the wilds of Demerara and Essequibo, with the chief object of collecting a quantity of the

strongest woorali poison; and after penetrating into the country where the poisonous ingredients grew, where the composition was prepared and used, success attended his adventure. After 121 days he acquired all the information about it, and a supply, which he brought back with him to England.

The poisonous extract is made from the woorali vine, a bitter root, two kinds of bulbous plants, two species of ants, the strongest Indian pepper, and the powdered fangs of the Labarri, and Counacouchi snake. The Macoushi Indian makes the best preparation. Having found the necessary ingredients, the Indian scrapes the woorali vine and the bitter root into thin shavings, and puts them into a kind of colander, made of leaves; this he holds over an earthen pot, and pours water on the shavings; the liquor which comes through has the appearance of coffee.

When a sufficient quantity has been procured, the shavings are thrown aside. He then bruises the bulbous stalks, and squeezes a proportionate quantity of their juice through his hands into the pot. Lastly, the snakes' fangs, ants, and pepper are bruised and thrown into it. It is then placed on a slow fire, and, as it boils, more of the juice of the woorali is added, according as it may be found necessary; and the scum is taken off with a leaf. It remains on the fire till reduced to a thick syrup of a deep brown colour. As soon as it has arrived at this state, a few arrows are poisoned with it to try its strength. If it answers the expectations, it is poured into a calabash, or little pot of Indian manufacture, which is carefully covered with a couple of leaves, and over them a piece of deer-skin, tied round with a cord. They ep it in the dryest part of the hut, and from time to suspend it over the fire to counteract the effect of ss. The operation of making it was gloomy and s. No woman or young girls were allowed to be

present, lest the Zabahout, or evil spirit, should do them harm.

The shed under which it had been boiled was pronounced polluted, the pot must never have held anything before, whilst the maker had to fast as long as the operation lasted. We may now consider that all the ingredients mentioned are not necessary to produce the effects of the poison, but that they were added through the superstitious feelings and custom of the natives. According to Waterton and Taylor:

1. The extract is so miscible with water, that the slightest moisture dissolves it, hence it speedily diffuses itself when introduced into a wound.

2. The symptoms are stupor and paralysis; it does not produce any apparent effect, until after the lapse of one or two minutes, and the wounded animal apparently dies without a struggle, and without pain.

3. The flesh of the animal thus killed may be used as food.

4. The dose must be proportioned to the size of the animal.

5. Like the serpent-poison, it is active when introduced into a wound, but almost inert when taken into the stomach (Bernard).

6. Animals poisoned by it have been restored by keeping up artificial respiration, as instanced by the ass "Wouralia," and by the experiments at Nottingham, in which Dr. Sibson took part.

7. The extract retains its power for an indefinite period, but unless kept dry it is liable to become weakened in its properties.

8. The effect is to destroy the motor power of the nervous system, and the observations of Kolliker and Pelikan show that its action is the very opposite to that of strychnia. M.

Bernard remarks that there is no direct relation between the chemical character of a substance and its physiological effects. The same or similar chemical characters may exist in two bodies—curarina and strychnia—of which the physiological effects are not only different, but antagonistic.

9. We may mention, as a memorandum to be borne in mind, that, according to Taylor, curara, which has but a slight action when swallowed, would, however, give the chemical reactions of strychnia in the stomach, and thus induce some chemists to swear that, beyond all doubt, strychnia was present, and that the person must have died from it.

In taking leave of Waterton and his woorali, we must direct attention to the following remarks made by him in 1844 :

"It is an acknowledged fact that the art of medicine has hitherto been unable to arrest the fatal progress of confirmed hydrophobia. This being the case, it is both wise and expedient to give the sufferer a chance of saving his life by the supposed, although as yet untried, efficacy of the woorali poison ; which, worst come to the worst, would by its sedative and narcotic qualities, render death calm and composed, and free from pain : a circumstance not to be expected under the ordinary treatment, or no treatment at all, of this ungovernable and fatal malady."

It is thus with every suggestion and invention ; like many diseases, they require an incubative period, before they take shape and form.

The woorali of the present day is differently prepared from that of the Indian preparation. It is called curara, and has many synonyms : *Ourari, Urari, Woorari, Woorara, Wourali, Wouraly.*

Besides the writers we have mentioned — Waterton, Taylor, Bernard—who have described this poison, the most

recent authority is Schomburgk, who states that it consists alone of vegetable matter, and chiefly of an extract of the bark of *Strychnos toxifera* (N. O. *Loganiaceæ*), a tree found native in Guiana. Waterton, as mentioned, describes his woorali poison as soft, whilst other writers speak of the necessity of keeping it in a perfectly dry state. Taylor ("On Poisons," 1875) says that "curara is a brownish-black brittle substance, having the appearance of Spanish liquorice. It dissolves slowly in cold water, but rapidly when heated, producing a turbid brown liquid; this becomes clear upon filtration."

We have mentioned in chapter the third, page 86, the solution which is prepared by Messrs. Corbyn, Stacey and Co., and we have since received some discs prepared by Messrs. Savory and Moore, who inform us that curara is an indefinite substance, the botanical origin of which is still uncertain; it is, however, the juice of some plant solidified or dried with variable quantities of extraneous matter. The active principle in this drug is an alkaloid obtained by Boussingault, as a non-crystalline, yellow, horny mass, deliquescent, capable of turning red litmus blue, and uniting with acids to form salts. Although curarine, the alkaloid of curara, possesses some of the characteristics of strychnine, sufficient proof has been obtained (*Vella. Pharm. Journ.*, vol. ii. p. 213) that it is totally distinct from the latter, and that their action is antagonistic.

Preyer was the first to isolate curarine in the crystalline form; according to him it has the formula $C_{10}H_{15}N$. It is very hygroscopic; has a very bitter taste; crystallises in colourless four-sided prisms; dissolves freely in water and alcohol, less easily in chloroform and amyl alcohol; and is insoluble in anhydrous ether, benzol, turpentine, and carbon disulphide. It acquires a splendid and permanent blue colour in contact with sulphuric acid, purple red with nitric

acid, and violet with potassium dichromate and sulphuric acid (like that of strychnia, but more permanent). Its hydrochloride, nitrate, sulphate, and acetate are crystallizable. Dragendorff also finds that curarine is quite distinct from strychnine, and that a very active curara occurs in commerce in which neither strychnine nor brucine can be detected. His "Manuel de Toxicologie" contains an excellent chapter on curarine.

Savory and Moore first prepared curara discs of the strength $\frac{1}{200}$th of a grain, but noticing that the amount of soluble extract varied greatly, they were induced to increase the proportions. Subsequently, being requested to make discs containing $\frac{1}{250}$th and $\frac{1}{100}$th of a grain of curara, they employed the alkaloid, curarine, in order to ensure uniformity, and produce definite physiological results. The curarine discs have one great merit, the almost absolute certainty as to dosage.

We need hardly mention that the syringe should be reserved for the use of curara alone, and that the surgeon must use every precaution, so as not to injure himself.

We shall lay down subsequently the conditions under which the curara should be used, so as to fairly test its value, for it would be unproductive of real advantage, to indiscriminately use it in every case of rabies. Unless it is employed by an operator who understands its physiological action, the method of controlling its action, so as to know when to stop, it would be simply dooming the patient to a more speedy death, and virtually grafting on the original disease another poison. We have seen how this has been done under the old treatment, when the patient was bled almost to death, and then saturated with deadly poisons, which only masked the symptoms of rabies. Reserving, then, our conditions, we may proceed with the more general directions. Presuming that the diagnosis of rabies has been

satisfactorily established, and that it is not confounded with any of those diseases we mentioned as sources of fallacy, attempts must be made to palliate the most urgent and distressing symptoms. As Fleming advises, everything likely to excite the patient should be rigidly abstained from, and he should not be tormented by visitors, inquisitive spectators, or by anything likely to excite his paroxysms. We know that external influences induce more frequent and severe attacks of the patient's distressing symptoms, and common sense will, independent of medicine, at once suggest the necessity of guarding the patient against such excitants. Quietude is an absolute necessity, and all useless interference or attention should be avoided. There should be no allusion to the disease, and no mention should be made as to the cause of it: thus dog's bites, etc., ought not to be spoken of, and the mind of the patient should be dispossessed, as far as possible, of the idea that he is suffering from rabies. As all the senses are generally morbid and painfully acute, everything likely to affect them should be abstained from; thus whispering in the room is to be condemned, and all manipulation tending to excite the exalted reflex irritability, as repeated attempts at drinking, is unwise; the patient's questions should only be replied to, and whatever he asks for, if believed to be proper for him, should be allowed. If the patient is an adult, precautions will be necessary against furious paroxysms; means for restraint must be at hand, and suitable attendants; but even when force has to be employed, it must be combined with gentleness. In the paroxysms and fits of fury there may be an irresistible desire to grasp something between the teeth, and this should be satisfied. It is easily done by placing a moistened napkin or handkerchief between the teeth; it may be removed as soon as the paroxysm is over. This will afford relief, whereas the neglect of it might increase

the frenzy. In the more tranquil form of the disorder, or during the intervals between the paroxysms, whoever the patient has most confidence in, whether relative or acquaintance, should be allowed to be present. If necessary the patient may be conversed with, or read to, and anything done likely to draw his attention from his condition. This companion should never be the first to speak, and when the sufferer seeks to talk about his malady, other subjects for conversation should be adroitly introduced. If the patient is thoroughly convinced that his disease is rabies, and will persist in speaking of it, and especially if he believes his case is hopeless, it will be best not to oppose him, but to admit such is the nature of the malady, and to hold out encouraging hopes by telling him of cases that have recovered. Every symptom should be described to him as a favourable omen in his progress towards recovery, and every means should be adopted to palliate the serious mental disturbance. We also know that owing to the hyperæsthetic condition, the patient is agitated by currents of air, the rustling of dresses, the shaking of the bed or of the floor, by light, sound, and other excitants of reflex actions and emotions, and these must also be carefully guarded against. For that purpose the patient should be placed in a room where all these conditions can be observed, and also seeing the evil effects of a bright light, the apartment should be darkened—the soothing influence of a modulated or darkened chamber in many diseases of a nervous nature is well known. As a rule, the medical treatment should be as little complicated as possible, and as it has lately been principally directed to soothing the nervous derangements, we can see by the tables the comparative effects of the various hypnotics, and their relative advantages. Chloroform has been used, but its effect as a pure curative has not been satisfactory; but it can be used as an auxiliary, for when under its influence injec-

tions of beef-tea and other foods may be usefully made; thus the distress caused by swallowing will be avoided, and as little as possible given by the mouth. Chloral hydrate is also a valuable auxiliary, and seems to have had a powerful influence in alleviating the agonising sufferings, and may be advantageously employed either in the form of an enema or hypodermic injection.

For this purpose it has been used with advantage in the case that occurred at Doncaster, and also in the three cases that happened at Nottingham. Other soothing, narcotic, or sedative agents, as hyoscyamine, morphine, digitaline, and atropine, may be used either hypodermically or endermically. It must be remembered, however, that the tolerance for poisonous remedies is extreme, and in addition to their being given in larger doses, they should be also administered at short intervals. Attention to the bowels we need hardly allude to, for that will be almost effected by the enemas, but should constipation occur, a drop of croton oil will soon remedy it. Nitrite of amyl may be used as a sedative, and chlorate of potass to wash out the mouth and saliva. This can be done with a sponge tied to a stick or brush.

Should the practitioner have his attention directed to a case during the earlier symptoms, when the patient complains of a peculiar feeling of *malaise*, the Turkish bath may be advantageously resorted to. Without assigning a *modus operandi*, but on the general principles of the Turkish bath as a valuable auxiliary, not only for the restoration, but for the preservation of health, we can unhesitatingly recommend it. We do not attach any importance to it as a curative agent *per se*, for though Dr. Buisson asserts that he not only cured himself, but also eighty patients who had been bitten by rabid animals, his evidence is not satisfactory, as we have shown that rabies will not necessarily develop after the bite of a rabid animal, and that it has not succeeded as

a curative when tried by other observers. As an auxiliary we should use it, in order to assist Nature, to soothe the nervous system, to equalise the balance of the organs of the body, to cleanse the skin, and thereby relieve the respiratory organs and the kidneys, for we know the intimate connection, if not in relation, still in function, of the large tract of the skin. We thus place the patient in as favourable conditions as possible. When the malady has actually declared itself, or made some progress, we cannot speak with such certainty of the assistance to be derived from the Turkish bath, for independently of the difficulty of applying it, it is a matter of opinion whether it might not increase the excitement, dyspnœa, and cerebro-spinal congestion. This can only be tested by experience. Turkish baths are not always available, but we have supplementary agents in the shape of domestic contrivances, which, to a certain extent, supply its place as the vapour bath. Individual ingenuity will improvise a method of applying hot air, if considered necessary, but it must be looked upon, as we have said, purely as experimental and supplementary treatment, and, if adopted, must not interfere with the other conditions we have laid down, as far as regards quietude and needless manipulation. We need hardly impress the necessity of the attendants protecting themselves against inoculation with the saliva of the patient, for though this secretion may not be so virulent in man as in the dog, yet it is an indisputable fact that it is potent enough to produce the malady. We have now laid down the outlines of a rational method of treatment, based on our present knowledge of this disease, and though we must confess we are leaving Nature virtually to do her own work, still we are assisting her; this we have to do not only with rabies, but with the majority of diseases, whether typhoid fever, small-pox, insanity, pneumonia, or the various forms of renal affections. Meddlesome interference, blind

empiricism, reckless administration of strychnia, prussic acid, we may confidently assert, can never produce such satisfactory results as following out the rules we have laid down on the broad line of common sense. Leaving, then, our general principles, we must formulate the special rules for an individual case or cases.

1. As rabies has become a national question, agitating the whole country from end to end, disturbing the very relations of life, exciting suspicion and distrust of our poor four-footed friend, the dog, we must insist on the necessity of Government appointing some special medical commissioners, who shall have charge of the treatment of every case of rabies reported. We have at present an organised staff, whose duty it is to inquire into the causation of zymotic affections, consisting of medical men specially fitted for scientific research, so that their sphere of action need only be extended. We know that mistakes in diagnosis have been made in the past, and, without the slightest reflection upon our professional brethren, mistakes will occur again. Virtually, the medical practitioner will thus have at his command the services of a consultant, and of an expert scientific observer, and we feel sure, in the interests of humanity, we shall meet with little objection on this point from our brethren. Necessarily, the services of this consulting officer cannot be instantaneously called into requisition, but as we have the telegraph, and rapid methods of transit, as little time as possible would be lost, and as patients do not die, as in cholera, within a few hours, time will be allowed for calling in aid. We shall thus, firstly, secure accuracy of diagnosis; and, secondly, the remedial action of curare will have a chance of being tested fairly and scientifically under the conditions we desiderate. We have said this poison was most deadly, and owing to its peculiar action its use should necessarily be restricted. It requires

careful administration; it must be apparent that unless precautions are adopted, its value cannot be fairly estimated, and therefore we require a crucial test. We shall, then, insist on the following conditions:

1st. Government shall appoint a sufficient number of qualified, scientific, medical men, if possible, at centres proportionate to population, and so situated geographically as to be readily accessible.

2nd. They shall be remunerated proportionately, and shall be at the service of any practitioner who telegraphed for them.

3rd. Until their arrival the medical officer in charge of the case shall follow out, not only our general directions, but also the following special observances:

A. He shall at once secure the services of a special attendant, who has been accustomed to deal with cases of insanity, and who will not be alarmed should the patient have paroxysms of fury. Every one acquainted with insanity is aware of the consternation excited in a household when any member of it is deprived of reason—how the patient is tied up with ropes in many cases, held forcibly down, and otherwise treated with brute force. But when brought to an asylum his bonds are cast away, and kindness and moral management take the place of brute force. For further particulars on this point we need only refer our readers to Conolly "On the Insane." Moral management and moral power are equally necessary in this disease—a disease so dreaded, and about which there is so much popular ignorance and superstition—and it is of the utmost importance that the nurse or attendant should be of the same intelligent type we have in many of our asylums. He will assist the medical officer in controlling the patient, if necessary, and in soothing or encouraging him.

B. If in a hospital so much the better, and so much easier

of attainment will it be to secure the second desideratum. The room should be carefully prepared. We see the advantage of this in special operations, as ovariotomy, and we are not asking too much to expect, if not similar, still such precautions as will have a tendency to assist Nature in rescuing the patient from the jaws of death. The room, then, should be capable of being warmed, without draughts or currents of air, and everything removed capable of exciting reflex action, or of irritating the unfortunate sufferer. Thus the floor should be rendered free from sound, the light should be subdued, all bright objects taken away, and the attendant move noiselessly; in other words, the intelligence of the medical officer will itself suggest all those more special precautions, which follow from our general principles.

C. The treatment must be of the simplest nature, and necessarily, the medical officer must be left a certain amount of intelligent discretion; attending to the action of the bowels, administering enemas of beef tea, or other aliment, controlling excitement, or the paroxysms of fury, if any; and here chloroform will prove of much advantage.

D. There are various ways of confining the patient to bed, as fastening a specially-made sheet over the bed, in such a manner that the patient will have the fullest power of moving and turning about. The hands are confined. This we have seen used with advantage in cases of fury and delirium from other causes. But these are points which each medical man will be able to solve himself, always remembering to obtain the greatest amount of control with the least amount of expenditure of brute force.

E. All visitors must be excluded, and as Fleming has pointed out, the patient may be allowed the choice of a friend or relative to sit with him.

F. If in a hospital, there will be some difficulty about the students, who, if introduced, must be so, not in large

batches, but with the observance we have laid down, remembering the avoidance of the reproach of Martial: "Languebam sed tu comitatus protinus ad me venisti, centum Symmache discipulis; centum me tetigere manus, Aquilone gelatæ: non habui $\frac{\text{Rabiem}}{\text{Febrem}}$ Symmache nunc habeo."

Presuming the consultant is summoned, and all these conditions observed, we have then the final appeal to curara. We have already explained its chemical action, nature, and dangers. The consultant will be specially acquainted with it, and he will apply it in the most scientific manner, and according to the experience he has of its physiological action. He will have, of course, to watch the case for some days, and considerable time and trouble will be involved in the task of experimentation. This is the least part of the difficulty. The self-devotion, self-sacrifice, zeal for the public good and public health of our profession has been often tested, and never found wanting. The records of our cholera, and other epidemics, have proved our disregard for self and life, while the Red Cross of Geneva at the present time bears witness to our professional spirit, not confined to one class or country, but to the whole of the human race. We could readily point at present to a number of scientific observers, who have done painstaking, dangerous, laborious, but unremunerative work, and we do not anticipate the slightest difficulty in securing a similar class of men to undertake experiments so highly important to the human race. Should it not succeed, still we must not despair. Medicine has progressed, and guided by the past, and by the lessons taught us by our advances in pathology, in the treatment of many other diseases, both medical and surgical, we must have confidence in our profession, and look forward to the future. When Jupiter presented the woman formed by Vulcan with the mythological box, and a divine command

never to raise its cover, amongst the fatal presents there was one which has ever been man's consolation.

Though Pandora, or, as some say, Epimetheus, from curiosity, neglected the divine injunction, and opened the cover of the box, from which flew out over the world the host of miseries, calamities, diseases, and human woes that have since afflicted mankind, still Hope remained . . . . as hope remains for us.

CHAPTER VIII.

TREATMENT: PRESERVATIVE.

THOUGH the virus of rabies may remain for a period confined to the wound in which it has been deposited, yet it is imperative that preservative measures should be promptly adopted. Fleming* points out that a fatal security might follow from a general belief in the theory of localisation of the poison for a length of time in the wound, and we thoroughly agree with his advice on the necessity of speedy action.

The first questions we have to consider are:

Can we definitely fix the latest period when intervention might be resorted to? Have we any definite knowledge of the rapidity of absorption? Analogy does not assist us very much on these points. We know that some poisons are rapidly absorbed, and we can chemically substantiate their presence in both the blood and secretions. The poison of the viper has also been thoroughly investigated, and from the experiments of the Abbé Fontana and those of Jesse Foot,† we can almost fix the latest period when excision of the bitten part would be useful. We know with certainty that the virus of rabies is not so rapidly absorbed. We have

* "Rabies and Hydrophobia," p. 321.

† Jesse Foot, "An Essay on the Bite of a Mad Dog," 1788.

adduced evidence of the probable arrest in the wound of the virus, an encysted or imprisoned condition, of which we have a rare example furnished in another disease. In the *Monthly Journal of Medical Science*, 1853,* the history of a singular case is recorded :

A girl, æt. 14, was affected with influenza. She also complained of pain in each arm, at the spots where, as an infant, she had been vaccinated. In fact, in these localities, vaccine vesicles soon became perfectly developed, and an elder sister being re-vaccinated with the lymph obtained from them, "beautiful" vesicles formed and ran a normal course.

We have not such positive evidence in regard to the localisation of the virus of rabies. Though, then, as Fleming says, the prompt removal or destruction of the rabific virus must be insisted on, in order to insure safety, yet we dare not despair of success even when it has been deposited in the wound for some time, and we are justified in resorting to preservative measures, even at so late a period as the cicatrisation of the wound. We cannot definitely fix the period or rapidity of absorption, and on this point further research is necessary.

Crucial experiments to test this point are difficult, though it might be possible to inoculate some animals with the virus, and at varying and subsequent periods, to excise the inoculated part and introduce it into another animal. Also, in case of the human subject, it might be possible, should the wound at any period exhibit an inflammatory or morbid condition, to further test the power of transmission possessed by the particles on other animals. We must then recommend those who should unfortunately be bitten by an animal to adopt precautions, and as soon as the bite is inflicted, resort to some of the measures we shall enumerate.

* "Rabies and Hydrophobia," p: 323.

When the finger is burnt or pricked by a pin, there is almost an instinctive feeling to put the finger to the mouth, and we shall then first consider the simplest of measures.

SUCTION.

This practice originated at a very early period, and was known in the time of Cleopatra, if not for rabies, as a remedy against the venom of the asp. It was rendered famous in England in the thirteenth century by the heroic exploit of the affectionate Eleanor, who, as history relates, safely and successfully sucked the wound of King Edward I., which had been inflicted by an impoisoned dart.* Dioscorides,† Celsus,‡ Galen,§ Aëtius,‖ extolled it, and Latta and Berkenhout¶ revived the idea, whilst more modern compilers have unhesitatingly recommended it.

Some, however, have condemned the practice, as Lipscomb,** who informs us, that it is only a pleasing delusion supported by history and fable. He says, it afforded the elegance of poetic fancy, a rich theme for poetic description; but while we admire the fidelity, attachment, and heroism of those who forget the value of their own lives in the attempt to preserve their friends, we should not commend the wisdom of physicians who promise indemnity for such dangerous undertakings.†† A modern physician, Sir Thomas Watson,‡‡ seems to share the needless fear of this old observer, and tells us that he dare not counsel the expedient

* Rapin, etc., *Baker's Chronicle*, p. 94.
† "De Med. Mat.," lib. i. 6. c. 40.
‡ Lib. i.
§ "Method. Medendi," lib. xiii., c. 6.
‖ "Tebrabil," 4; "Sermo," i. c. 10.
¶ "An Essay on the Bite of a Mad Dog," Berkenhout, 1783.
** "The History of Canine Madness," Lipscomb.
†† "Severini," c. 5.
‡‡ *Nineteenth Century*, Dec., 1877.

of suction, as by it the sufferer might be rushing, or bringing his helping neighbour, into the very peril he was anxious to avert.

We are diametrically opposed on this point, and must, unhesitatingly, recommend it. We agree with Fleming* that suction for the removal of poisons from wounds has been practised from time immemorial, and yet there is no evidence whatever to prove that it has been a fatal practice. On the contrary, not only has the operator in every recorded instance escaped danger, but the operation itself appears to have, in many cases, preserved the life of the wounded individual. The poison is not retained in the mouth, but is immediately and forcibly expelled, so that if there be any danger of absorption by the mouth, or by an abrasion, the chances of infection are infinitesimally small. Even though the risk was greater than it is, it should not deter the bystander from attempting a noble and devoted act.

Performing an autopsy is dangerous; offering blood for the operation of transfusion, jumping into a river to rescue a drowning person, are attended by risk; but, fortunately for humanity, there are volunteers always forthcoming to endanger their own lives for the benefit of their fellow-creatures.

Suction, then, should be energetically and speedily employed, either by the bitten individual or the bystander, care being taken to spit freely after each application of the mouth, and, subsequently, the mouth may be rinsed with some fluid, as water, milk, vinegar, or beer, or spirits, which are generally attainable, even though water may be scarce. It must ever be remembered, as Fleming says, that time is a most important element, and waiting for caustics, cupping-glasses, or the surgeon's scalpel may be synonymous with waiting for death.

* *Veterinary Journal*, p. 16, 1878.

EXPRESSION, WASHING, COMPRESSION, AND CUPPING.

Bleeding should be encouraged, and the wound squeezed and well washed with cold or tepid water, or any convenient fluid, and suction again repeated. Compression is also an old remedy, and Moseley* advises, when a person is bitten, remote from any assistance, he should make a tight ligature above the part until proper assistance can be obtained. This simple plan may be usefully adopted : it consists in tying a handkerchief, bandage, strap, or cord round the wounded part, so as to arrest the circulation ; it must be applied between the wounded part and the heart ; as, for instance, if the wounds be on the arm, it should not be applied towards the hand, but above the wound, towards the elbow.

It is an adjunct to suction, washing, and other local treatment.

Cupping.—Cupping consists in applying an ordinary glass over the wound so as to promote the flow of blood ; it can only be employed on certain parts of the body. An enthusiastic writer, in the *Gentleman's Magazine* for 1751, suggested that all physicians, surgeons, apothecaries, and other practitioners in physic, together with the incumbents of the several parishes throughout the kingdom, and every family in the kingdom, should be provided with cupping-glasses, upon which the editor remarks, that if he did not know the author, he would be apt to think his profession was that of a glass-maker. In the same journal, same year, the bowl of a tobacco-pipe is advised to be applied, and strong suction made at the small end.

CAUTERISATION.

The surgeon may adopt the actual cautery, a method dating from the most remote antiquity, though the objection has been raised against it that the eschar formed on the sur-

* Moseley, "Treatise on Tropical Diseases," p. 37.

face or upper part of the wound might cover and shut up some portion of the infectious matter, which remaining unaltered, might afterwards produce the disease. He will of course use his judgment and modify his treatment according to circumstances.

The operator will have to consider the nature, size, and situation of the wound, whether narrow, deep, or angular, whether extensive, and whether on the face or portions of the body, where difficulties of application, from various causes, might arise. This remedy must be accurately applied, and he must endeavour to completely destroy the surfaces which the poison has touched. If the surgeon is consulted at an hospital, or at his own residence, he will have proper appliances, but, if suddenly called on, he will have to make a selection of the cautery, from some of the domestic articles found in every dwelling. If the wounds are superficial and easily reached, he can heat to a bright red or white heat a key, small poker, or any other article, and apply it freely, unsparingly, *mercifully*. If deep and narrow, he will have to select a pointed instrument, as a skewer, etc., so that it may come in contact with the deep wounded surfaces. At an hospital, and under some circumstances, chloroform or ether spray may be used, so as to render the patient insensible to pain. All the older physicians were in favour of keeping the wound open after the cautery, and were not anxious for speedy cicatrisation. Without mentioning Dioscorides, Galen, Avicenna, Ambrose Paré, we may refer to the Zurich treatment, and to the practice of Wendt and Ekstrom, mentioned in a previous chapter.

It may not be necessary to apply the irritating substances they used, but it certainly, on the evidence we have, seems preferable to keep the wound open for five or six weeks, and to encourage suppuration. The treatment of a case of rabies illustrates the indivisibility of medicine and surgery, and we

may here introduce an extract from an old and experienced physician's writings.

Dr. Moseley* remarked in 1808 : "Another misfortune to humanity is, that since the separation of physic and surgery into distinct professions, every physician and every surgeon is not qualified to undertake complicated cases, such as wounds from rabid and venomous animals, with their consequent diseases. A surgeon now is supposed to know as little of physic as possible, and a physician is supposed to know about as much surgery. What, then, must be the fate of a patient in the hands of either, who requires the utmost aid of both? Hence it is that the knowledge of hydrophobia, and the treatment of the bites of mad dogs in particular, have not advanced with other improvements in medicine. They are as ill understood as they were in the time of Celsus ; nay, worse, because Celsus was as renowned in surgery as in physic, and his method was not without great design in both."

Fleming reminds us that on occasion it may not be possible to obtain the cautery sufficiently soon, and we may have to provide a substitute. In these cases a lighted lucifer-match or fusee thrust into the wound may be very serviceable ; and filling the cavity with gunpowder and exploding it appears to have proved an excellent method of cauterising dog-bites. According to M. Manière, who resided for fifteen years in Hayti, rabies is very frequent there, and appears in all seasons ; but the accidents arising from it are not at all in proportion to the number of persons bitten, as every one knows what to do. Gunpowder is to be found in any house, and in nearly everybody's pocket, and is used in the manner described. Afterwards

* "On Hydrophobia : its Prevention and Cure." Illustrated with Cases. By B. Moseley, M.D., Physician to his Majesty's Royal Military Hospital at Chelsea, etc. London, 1808.

a blister is applied, and a mercurial treatment, carried to salivation, completes the case. Notwithstanding the frequency of bites from mad dogs, M. Manière has only seen one person die of hydrophobia, and that individual refused to be treated according to this plan.

EXCISION.

We have mentioned the name of Jesse Foot,* who asserted that excision by a knife of the bitten part is the only sure and certain method of prevention, and that the sooner it be done after the bite the better. He very naïvely remarks that one does not want to know the utmost extent of time it will be dangerous to wait for, but one is anxious that the operation should take place as soon as possible after the accident. Foot illustrates his opinion by several cases. He claims the first case of Eliz. Pratt (*loc. cit.*) as the first instance upon record where excision of the bitten part with a knife has been solely relied on.

Foot was opposed to the use of caustics, in which he said he was confirmed by the fatal result of two cases thus treated by Dr. John Hunter, where caustic had been carefully, accurately, and freely applied. Foot insisted that the sucking of the wound, the application of cupping-glasses to the part, the actual cautery, the filling it up with gunpowder and setting it on fire, the turning the wounds into an issue, the enlargement and scarification of the bitten parts, were all fallible. Anything short of complete removal he considered a criminal imperfection. Lipscomb† mentions that Monro and Hunter state that the disease may be prevented by excision of the bitten part at any time before the occurrence of the second inflammation of the wound. This opinion

* "A Plan for Preventing the Fatal Effects of the Bite of a Mad Dog; with Cases." London, 1793.

† Lipscomb, Pamp., p. 172.

Lipscomb condemns as replete with danger and deserving of public and solemn denunciation, for delay might sacrifice many lives which promptitude might have preserved. Abernethy recommended the following plan: The cell into which a penetrating tooth has gone must be cut out. Let a skewer be shaped as nearly as may be into the form of the tooth, and then be placed into the cavity formed by the tooth; and next let the skewer and the whole cell containing it be removed together by an elliptical incision. The removed cell must be examined, to see if every portion with which the tooth might have come in contact has been taken away, and the cell may be even filled with quicksilver to see if a globule will escape. The surgeon will use his own discretion as to the extent of the operation, and will follow out general surgical principles, both as regards the form of the incision, the depth, the use of carbolic acid, clean sponges, free washing with cold water, remembering to do his work well and thoroughly. Fleming's* remarks are very true when he says, excision is not always easy or safe because of the situation of the injury and its anatomical relations, and if a wound penetrates a joint, the eye, or other important region, the difficulty is increased. Foot† mentions the time when excision was performed in his cases, and we mention them as a contribution to our facts:

Case I.—After 32 to 35 hours.
Case II.—After 68 hours.
Case III.—After 12 hours.
Case IV.—At once.
Case V.—After 72 hours.
Case VI.—After 20 hours.
Case VII.—After 6 hours.
Case VIII.—At once.

* Fleming, *loc. cit.*
† Foot, *loc. cit.*

The knife has the advantages of facility, of the quick and immediate removal of the virus, but it requires a certain degree of skill. When surgical assistance cannot be procured we do not imagine there are many persons who would have sufficient courage to extirpate the wounded part with a knife, and there are very few who would have the resolution to cut the part out themselves—nor is it necessary if they have recourse to some of the other measures open to them. Though excision has been highly praised, and has proved almost a certain preservative, we have equally satisfactory evidence of the efficacy of the next measures we are about to consider.

CAUSTICS.

Lipscomb preferred the use of a caustic when it could be immediately and accurately employed, and we have mentioned Youatt's belief in the nitrate of silver, which seems to have been also recommended as a local application by a German professor, M. de Mederer.* The caustics which have been and may be employed are numerous, and may be more or less lauded. The strong fluid acids, as acetic, nitric, sulphuric, hydrochloric, and carbolic acid, and such powerful escharotics as nitrate of silver, perchloride of iron, muriate of antimony, and corrosive sublimate, have been generally employed, as well as strong ammonia, caustic potass, or soda, chloride of zinc, quick-lime. That agent must be employed which is most convenient and most prompt, time being an all-important consideration.

Whether a solid or fluid caustic be used, it should be employed unsparingly, and some of the best are nitrate of silver, potassa fusa, muriate of antimony, perchloride of iron, or carbolic acid.

The fluid caustics have been more resorted to, as they

* "Medical Facts and Observations," vol. i. p. 17.

more certainly penetrate all the sinuosities of the wound. The nitrate of silver is generally at hand, as most surgeons carry it in their pocket-cases. We need not enter into detailed particulars as to the exact methods of procedure in each case, as they are simple; their efficacy, however, depends on their free use.

THE RESULT OF CAUTERISATION, EXCISION, AND CAUSTICS.

It is to be regretted that we have not more means of ascertaining to what extent cauterisation, excision, and the application of caustics to wounds have been used, nor of estimating their relative value; we have some isolated and individual statistics, as those of Blaine, Youatt, Earle, Ekstrom, Wendt, and from Zurich, and they are of a sufficiently satisfactory character, establishing the advantages of precautionary measures.

We are indebted to Fleming for the following particulars:

M. Bouley, impressed with the great interest that belongs to this question, has endeavoured to make the most of the statistics available to him, and has given the result in the following terms:—"If we compare with regard to their consequences the bites from rabid animals, which have been cauterised, and those which have not, a considerable difference is remarked with regard to their consecutive innocuousness. In fact, in 134 cauterised wounds, the innocuity is shown in 92 cases, and the mortality in 42; or 68 per cent. in the first, and 31 in the second. For the non-cauterised wounds the result is the reverse of the above, and is much more manifest. In 66 of these the mortality is 96, or 84 per cent., and the immunity only 10 or 15 per cent."

But this excellent authority adds, in default of sufficient information with regard to the cauterised wounds, it has not been possible to establish a distinction between them as to the degree of cauterisation they received or the time at which

it was applied—two conditions on which the certain efficacy or complete inutility of this means of preservation depend. If this information had been furnished, there is every reason for stating that the number of cauterised wounds which remained inoffensive would have been considerably increased, as the destruction by fire of the tissues in contact with, and even impregnated by, the virulent saliva, it may safely be asserted, prevents the disease, if resorted to before absorption has taken place. Of 115 cases of rabies terminating in death in France, Tardieu has tabulated them as follows, in order to show the results of neglect or tardy cauterisation of the wounds:

Years.	Died of Rabies.	Not Cauterised.	Tardy Cauterisation.	Insufficient Cauterisation.
1852–53–54	44	26	18	0
1855	21	11	5	5
1856	20	11	6	3
1857	13	10	3	0
1858	17	6	5	6
	115	64	37	14

In Algeria, out of 16 cases, 14 had the wounds inflicted by rabid animals, cauterised more or less promptly; in two instances three persons were cauterised 24 hours after being wounded, and a fourth in 36 hours. The following table gives the detail of the 16 cases:

Immunity after—

Immediate cauterisation with the hot iron	7
„ „ by cones of gunpowder ...	1
Cauterisation by late application of hot iron... ...	1
„ after at least 24 hours	3
„ „ „ 36 „	1
„ with muriate of antimony after 3 hours	1
Immunity without adopting precautions	2

Thus it will be seen that one half of the cases of immunity might be supposed to be due to immediate cauterisation, three-eighths to tardy cauterisation, and one-eighth escaped without any treatment.

Of the 47 deaths tabulated by Roucher as occurring in Algeria, we find that their relations with preventive or preservative measures are as follows:

Died without wounds having been cauterised... ...	25
„ „ indications of precautions	10
Died after tardy and incomplete cauterisation with hot iron	2
Died after tardy cauterisation with the hot iron ...	5
Died after tardy and incomplete cauterisation with nitrate of silver	1
Died after immediate cauterisation with ammonia, supplemented by the hot iron an hour and a half subsequently	1
Died after immediate cauterisation with ammonia ...	2
„ „ „ „ „ hot iron ...	1

In 47 deaths only one occurred after immediate cauterisation with the hot iron; 12 were preceded by delayed or insufficient cauterisation, and 35 had not been submitted to any preventive treatment, for it is very probable that in the 10 cases which afford no indication of precautions having been adopted, none were resorted to, so that, of the 37 cases allowed to take their natural course there were 2 of immunity, and 35 deaths, or a mortality of 94·6 per cent. Of the 9 in which cauterisation with the hot iron was immediately employed there was only 1 fatal case, or a mortality of 11 per cent., and of the 16 cauterised after some delay, or in a manner more or less imperfect, there were 10 deaths, or a mortality of 62·5.

Among the fatal cases more or less known, there was only one in which the wounds had been at once treated with the

actual cautery, and another in which ammonia was applied first and the hot iron afterwards. In three instances there was a delay of nine and twelve hours, and in other three, of some hours. In three more of the 47 cases cauterisation was incompletely affected by ammonia or nitrate of silver; in one case cauterisation was only resorted to after two days, and twice the wounds were dressed immediately with liquid ammonia.

The only patient who died after having his wound immediately cauterised with the hot iron was believed to have been saved, as he enjoyed excellent health for six and a half months, and in that time had taken part in the expeditions against the Kabyles in 1851, and returned quite well.

In the two which had the wounds dressed immediately with liquid ammonia the period of incubation extended to 116 and 130 days, a circumstance which might give rise to the supposition that caustics have a retarding influence on the development of the disease.

GENERAL TREATMENT.

Having thus complied with some of those measures recommended by the test of practical experience, the physician may have to exercise his discretion in further dealing with his patient, and it may become a question whether he should order any medicine or any supplementary treatment. Though we are satisfied that there is no specific internal remedy, yet the administration of some form of medicine may have a beneficial action in soothing the fears of nervous or timid subjects. Mental influences play a very important part in this disease, and they must necessarily not be overlooked. The physician will be guided by the temperament and peculiarities of his patient, and if he considers the administration of calomel, sulphite of soda, magnesia, or carbolic acid likely to satisfy his patient's mind, he should certainly order such

innocent medicaments. Bouley says: "He is convinced that the practices or medications, whatever they may be, which address themselves to the morale of those who are the victims of rabaic inoculations may prove very useful, and that he has caused persons who were labouring under the dread of hydrophobia to take some innocent beverage as an infallible specific." He adds: "The memories I entertain of the immense contentment it has produced have always confirmed me in the belief that it is not good to destroy such illusions and belief, but, on the contrary, to create them."

This no doubt may be called charlatanism, but when we remember that in a large number of diseases we are obliged to order some innocent form of medicine in order to secure the adoption of the rules of diet and hygiene which are our real remedial measures, it may be more excusable to order a placebo when we are dealing with patients who are harassed by anguish and phantoms of the mind, and who require to a greater degree all the encouragement and consolation we can lend. We must act on the mind by our own moral power and influence, and by impressing, if remedial measures are adopted, their security. If our patient's nervous system requires stimulation we must adopt appropriate treatment to restore it to its normal tone. If sleep is absent or disturbed, we have a choice of agents, and remembering the value of refreshing sleep in restoring nervous power, we may legitimately resort to chloral hydrate, or the subcutaneous injection of morphia.

One of the most useful supplementary agents we consider the Turkish bath. We do not regard it as a preservative *per se*, but it may be advantageously employed as an adjunct to mental treatment. The Turkish bath is a most useful auxiliary in the medical treatment of nearly all diseases, and recognising its power in relieving the pores, and thus restoring the proper balance of the skin's function, in eliminat

ing noxious matters from the blood, in imparting general tone and elasticity to the system, we recommend it as an appropriate adjuvant. Unfortunately, like many other useful measures, its efficacy has been too highly vaunted, and enthusiasts have claimed for it the place of a universal *panacea* in all diseases. We do not attach much importance to the case of Dr. Buisson, for his description of his sensations is not in accordance with that furnished by the majority of observers; and some of his facts, as that a patient can drink when blindfolded, are not verified by practical experience. We have, however, abundant testimony in its favour furnished by those who have been bitten, and who, after adopting the preservative measures we have mentioned, have been nervous and alarmed. They were restored to a positive sense of security by the use of the bath.

From inquiries we have made at numerous baths, we have gathered a large amount of information confirmatory of this view. We need not particularise the various details connected with the Turkish bath, as it has become almost a necessity of modern life, and we presume there are few medical or laymen who are not thoroughly acquainted with the *modus operandi*.

As free and copious perspiration has been advised, and regarded as a safeguard, it is secured in the fullest extent by this system. No contra indication existing (as in women, advanced pregnancy, etc.), its judicious employment may be directed. Whilst the patient is under treatment the well-known "lyssi," mentioned by Zanthos, Marochetti, and Magistel, might be looked for; they have not been found by the majority of observers. We have mentioned their situation, form, and the treatment adopted by those observers.

We must lastly bear in mind a very important matter mentioned and impressed by Fleming: "If a person has been bitten by a dog, or if animals have been wounded by it, and

the creature at the time does not exhibit any distinct signs of rabies, it is well, in order to tranquillise the minds of those chiefly concerned, and who are apprehensive of danger, to secure it properly for a number of days, say a fortnight or three weeks, before allowing it to go at large again. If it was really rabid when it inflicted the injury, it will soon exhibit unmistakable signs of the disease and die; or it may then be killed, and every precaution taken accordingly. If the above-mentioned period passes without any manifestation of rabies, then the possibility of future disaster ensuing from the wounds is happily disposed of, and great anxiety abolished. But if the dog is destroyed without any evidence that it was suffering from the disease, then months of the most painful suspense, and even anguish, may perhaps elapse before the result can be known. In these circumstances all that can be done is carefully to inquire into the aggressive animal's history, ascertain all the symptoms exhibited by it, and its behaviour immediately before and after inflicting the wound."

In any case, however, there should be no hesitation or delay in adopting the precautions just indicated to preserve those bitten from after consequences. M. Desjardine fully recognises the value of this measure. As soon, he says, as a person has been bitten by a suspected animal; hasten to secure it so that it can do no more damage, and watch it closely instead of killing it at once, as is the custom. Give it several drops of syrup of buckthorn, and afterwards a dose of phosphorus, 15 centigrammes, reduced to powder and mixed in sufficient quantity of water. If the animal lives its healthy condition should be made known to the person, for the mind exercises so great an influence that it seems at times and in certain conditions, according to the idiosyncrasy of the individual, to constitute the sole and unique cause of this terrible affection. But if, on the contrary, the dog dies,

its death must be carefully concealed, or another must be substituted, in order to make the person believe the animal was healthy, and that the treatment to which he was submitted was merely adopted to dispel the fear and alarm he experienced at the seat of the injury.

We have now fully considered curative and preservative measures, and, lastly, we must deal with the most important section—Prevention.

CHAPTER IX.

PREVENTIVE TREATMENT.

SANITARY science has become one of the most important branches of human knowledge and research. It aims at suppressing diseases entirely, by preventing the diffusion of the virulent elements, on which their maintenance and vitality depend; and preventive measures, if carried into operation with energy and circumspection, cannot but have a controlling power over the spread of rabies. The measures we recommend should have for their object not only the prevention of disastrous consequences to mankind from the presence of rabid dogs, but should also be based on humane and utilitarian principles so far as dogs and other animals are concerned. We may say that the veterinary police measures to be applied to this disease are founded on the consideration that, though it *may* be developed spontaneously in the canine and feline species, and though this spontaneous development may be more or less averted by proper hygienic treatment of these animals in a domesticated state, yet that perhaps 999 in 1000 cases are due to contagion alone, and that, therefore, the destruction of the contagious source or sources is of primary importance: also that rabies is not peculiar to any season, but may and does appear at all times of the year in a sporadic or epizoötic form. These measures in the general interest of the community should

be adopted and rigorously enforced, and owners of dogs or other domestic animals should be compelled to attend to them.

HYGIENIC TREATMENT OF DOGS.

No amount of reasonable care can be considered superfluous to preserve the health of domestic animals, and to protect them from disease and its results. Hence the hygiene of the dog is so important.

Animals should be provided with wholesome food, solid and liquid, and cleanliness cannot be too strictly enforced. Their kennels should be provided with fresh straw, fine shavings, or sawdust, and their supply of water should be unlimited.

Dogs should not be needlessly excited, abused, or maltreated. If it should happen that an excited dog bites anyone, the person who excited it should be held guilty of a legal offence. This is in accordance with the Austrian law and the jurisprudence of our ancestors in this country—the Celts.

Dogs should be allowed exercise, and nothing can be more reprehensible than keeping them confined to houses for days together, or chaining them for weeks and months to a kennel. It is quite opposed to the animal's natural instincts. All quarrelsome and vicious dogs should be particularly taken care of by their owners, and neglect of precautions should bring the offender within the penal code. This is also in accordance with French law.

DIMINISH THE NUMBER OF USELESS DOGS.

In an economical point of view the diminution of the number of useless dogs is most desirable, and from a sanitary point of view is even more essential. Useless dogs are badly kept by poor people, and are allowed to run about dirty and diseased. They are a source of waste and insalu-

brity, as they absorb the already insufficient supply of oxygen in the miserable and badly-ventilated dwellings of their owners, and they consume a certain quantity of food that can ill be spared. Pleasure dogs kept by the richer classes are scarcely less a source of danger and extravagance, for they appear very predisposed to rabies, whilst the food they consume forms no inconsiderable item of expense.

If we calculate the number of dogs licensed, and add at least half that number as escaping the duty, and estimate the value of the food consumed at 1d. per day, we can form an approximate idea of the sum annually expended. Thus, in England and Scotland the number of licenses issued in 1870 was 1,063,967 (Mr. Cockell, Inland Revenue Office).

In France, in 1855, it was computed that there were 3,000,000 dogs, costing 18,000,000 fr. annually. In Austria the number of pleasure dogs is said to be 1,000,000, and the expense of their annual keep 3,000,000 gulden. This decrease may be effected in several ways, the chief of which are taxation and the capture and, if need be, destruction of vagabond or stray dogs.

The evidence of other countries, as Baden and Copenhagen, establishes that the imposition of a tax upon dogs is generally very effective in diminishing their numbers, and the higher the tax and the more strictly it is imposed, so will the useless dogs become fewer.

A measure of this kind should be resorted to. It would be most effectual in ridding the country of a number of miserable and dangerous animals. But to be really efficient the tax should be general and high, exception being only made in favour of dogs that are useful, or whose services can be proved to be absolutely necessary, such as house and yard dogs, or those employed by shepherds, or to lead the blind about.

The tax should be highest for pleasure and sporting dogs,

for whoever can afford to indulge in keeping such animals can also afford to pay a high tax. If, however, it can be shown that sporting dogs are necessary, then the impost might be reduced to that levied for useful animals.

Dogs and bitches should be equally taxed; puppies should be sold, not given away, and all that are not purchased should be destroyed.

As soon as they are weaned, the tax should be demanded. The tax should be paid half-yearly. Every dog should wear a collar, with a brass plate inscribed with the name and address of the owner, and stamped with a particular mark of the police or inland revenue authorities, as a guarantee that the tax is paid, and for purpose of identification. This custom exists in Holland, and is very effectually carried out at Strasburg. At the latter place every owner must notify his possessing a dog to the police, who furnish him with a license, duly numbered and registered. This number, with the address of the owner, is inscribed on the collar which every dog has to wear.

It would be well if in all towns and villages there was a dog census, or list of the dogs kept therein.

All stray dogs without the collar, or which have not the mark or their owner's name thereon, should be captured and sold or destroyed immediately or after a certain period. This period might be extended to three days, and if the animal be claimed by its owner, a fine must be imposed and all expenses paid. At Strasburg the expenses amount to 15 fr., so that 15s. in England would not be an excessive fine.

Straying dogs may, even when furnished with a collar, under certain circumstances—as when rabies prevails—be seized by the police and conveyed to their owners, who shall pay all expenses.

This addressed and numbered collar is useful in the case

of damage done by dogs, as every one should be held responsible for the damage done by his dog, due to his negligence or imprudence. Bitches in rut should not be allowed to wander about at any time, whether with or without the collar, as they excite dogs and lead to quarrels.

EMASCULATION.

Neither experience nor observation at present justify recourse to this measure. It may be left to the discretion of dog owners.

BLUNTING THE TEETH.

This operation has been proposed with a view of reducing the dog's jaws to the same condition as that of herbivorous creatures, whose bites are not so dangerous as those of the carnivora—so far, at least, as the inoculation of the rabid virus is concerned.

M. Bourrel, who has had a long experience of dogs and rabies, has proposed this measure, but it has never been carried into general practice.

MUZZLING.

The use of the muzzle has become such a popular institution in nearly every country in which legislative measures for the prevention of injuries from dogs have been adopted, that any question as to the benefits conferred by it may be deemed superfluous by those who have not paid deep attention to the subject. The old muzzle has almost now disappeared, and we have only to consider the more modern and improved wire muzzle. The most varied opinions prevail in reference to its value. By some it has been deemed useless or worse, whilst others are satisfied that by the adoption of a properly-constructed muzzle the dangers resulting from rabies might be averted. The principal French authorities incline to the former opinion, while the German

veterinarians appear to favour the second. We are inclined to the opinion that the muzzle should only be worn on special occasions, as when rabies is prevalent in a locality, or when it has a tendency to assume an epizoötic form, or in the case of vicious dogs. We must not forget that this muzzle cannot be an efficient safeguard unless it is, as M. Bouley says, riveted to the dog's neck, as the manacle is to the foot of the galley-slave, and that night and day the animal should wear it, indoors as well as out-of-doors.

When the disease threatens to become prevalent, or, indeed, when there is reason to believe that a mad dog has bitten several others, and these cannot be discovered, the use of the muzzle should be resorted to—not as a prophylactic, but as an adjuvant.

All dogs seen in the streets of towns, or in the country, without a muzzle should be seized by the police as suspicious animals.

This is one of the great advantages of employing the muzzle, for as it is stated by good authority that rabid animals escape from their houses unmuzzled, a dog so unprovided, especially when muzzling is in force, should be at once captured. In this opinion we are strengthened by the evidence of Fürstenburg, of Eldena, Prussia, and of Hering, Director of the Veterinary School at Stuttgart.

To be beneficial it is obvious that the employment of the muzzle must be universal; but, at the same time, should the disease be prevalent, the other necessary measures must not be relaxed; neither must the vigilance of dog owners be diminished, for it must be remembered that if a dog wearing a muzzle runs about without any one in charge of it, it is possible that a mad dog may attack and bite it; the wounded animal then returns to its home, and the owner may know nothing of what has happened until all at once rabies appears quite unexpectedly.

A well-constructed muzzle is a protection so long as it is worn by the dog, but a bad muzzle is worse than useless, as it establishes a false security.

Dogs soon become accustomed to an easy, comfortable muzzle—that is, one in which they can always breathe and drink without hindrance. The nostrils of the dog are very narrow, and even under ordinary circumstances he cannot breathe so comfortably as many other animals when its mouth is forcibly closed.

When distressed by running the dog always respires with open mouth, and in warm weather the transpiration that takes place in this cavity from the throat, tongue, and inside the cheeks tends to keep the creature cool, and compensates for the almost total absence of this process of the skin. Therefore, the front portion of the muzzle should be sufficiently accommodating as to allow of the animal wearing it to open its mouth freely and widely. The muzzle patented by Grauhan is a good though not a very safe one in its present form. To make it perfectly secure at the mouth, there should be intermediate wires, from the circular transverse wire, near the eyes, to the vertical nose wire. The muzzle should fit the head properly, and, above all things, it should be securely fastened round the neck. The neck strap should be strong, and as tight as can be, compatible with the dog's comfort.

QUARANTINE.

The idea of completely extinguishing rabies by establishing a quarantine of several months' duration amongst dogs was based on the assumption that the disease is only maintained by contagion, and never arises spontaneously, and that, therefore, if these animals could be confined for a certain period without any intercourse or any chance of the contagium being transmitted from those that were infected

at the commencement of the measure, the pestilence must inevitably die out.

The preventive scheme proposed by Bardsley rests upon the validity of the following propositions:

1st. That the disease always originates in the canine species.

2nd. That it never arises in them spontaneously.

3rd. That the contagion, when received by them, never remains latent more than a few months.

Quarantine would, no doubt, be as effectual in stamping out rabies as in stamping out any purely contagious malady, were those propositions absolutely correct, and the measure completely and permanently enforced. But, unfortunately, the disease originates in other than the canine species, and in other creatures besides the dog, and, unfortunately, also, we are far from convinced that it never occurs spontaneously; on the contrary, though ready to admit that in the great majority of cases it is spread by contagion, there is evidence which tends to show that it may arise without this influence. Besides, this authority proposed only two months as the period which he considered long enough to afford every prospect of success, whereas it is a well-established fact that the incubatory stage is frequently protracted to a much longer interval: indeed, he admits this when he adds, "that it would undoubtedly be erring on the safe side if the time of quarantine should be extended to the very unusual period of eight months." It will be seen at once, by those who know anything about veterinary sanitary matters, that a strict quarantine for dogs for such a period, or even for the comparatively short space of two months, is absolutely impossible at present, and perhaps will always be so, and also that, supposing the disease to be confined to the dog species, and the quarantine to be religiously observed or rigorously enforced, other countries might not think fit

to submit to the serious inconveniences arising from this measure, and consequently we should, in all probability, have the contagion introduced into the country again in a very brief space.

PUBLIC INSTRUCTIONS.

Dog owners, when they receive their tax-papers, should be provided with printed and easily-understood instructions as to the proper method of keeping their dogs healthy, and how to detect the symptoms of rabies. They would thus be informed of the preservative and sanitary police measures, which they should comply with in order to prevent the disease. All this might be printed on the back of the tax-paper, which could, in addition, be made a valuable means of arriving at certain important information, such as the sex, age, breed, of the licensed dogs. The most serious accidents have occurred through the ignorance of the public on simple matters connected with rabies. Such, then, are the general measures to be recommended with regard to the prevention of rabies at ordinary times and at all seasons, for our investigations have shown in the clearest and most positive manner that the disease is not peculiar to any particular period of the year, nor limited to any season, but may prevail at any time. Therefore, careful supervision should be extended to all dogs throughout the year, and not only during the "dog days;" and it is to this supervision and a possession of a general knowledge of the symptoms of the malady by every one who keeps a dog that we must look for success in keeping down the contagion, and preventing the sacrifice of human and animal life through the effects of this disease.

We look, then, for improvement very much to education, and to the principle of personal responsibility of dog owners.

Fines and penalties would affect their pecuniary interests

—unfortunately so much more powerful than those of a sanitary character—for they thus learn that, in the words of M. Bouley, "the fear of a diseased dog is not only the beginning of wisdom, but wisdom itself."

MEASURES TO BE ADOPTED WHEN RABIES HAS APPEARED.—SUSPECTED ANIMALS.

If, notwithstanding these measures, morbid or unusual symptoms appear in a dog, and particularly if cases of rabies have occurred in the vicinity shortly before, it should be carefully observed, and every precaution taken, as these may be premonitory symptoms of madness, which is contagious from its commencement.

The animal should therefore be constantly watched and kept apart from mankind and other animals, and in feeding or attending to it the greatest possible care should be taken that it does not bite any one at this time. No children should be permitted to approach it, and all neglect of these precautions ought to be visited with severe punishment. If the morbid symptoms become more marked or more suspicious, if it is observed that the dog manifests any of the peculiarities proper to rabies, that it is dull and bad tempered, moves languidly from place to place, or seeks to go away, that its ordinary habits have changed, that it is hostile to people or animals, that it attempts to bite everything, then it is time to chain it up securely, or keep it in such a way that no one can be injured by it. If the owner has not the means of affording sufficient security he should report the circumstance to the local police, under the penalty of criminal liability. Whoever knows of a dog, or any animal placed under exposed conditions, must also report to the police under a similar criminal responsibility. The Austrian penal code is very strict on this point, and for an infraction of the law renders the culprit liable to incarceration, from

three days to three months. If the death of a man has been the consequence of neglect, the penalty is from six months to a year's close imprisonment. Should a dog in a suspicious state escape from home, the local authorities should give warning to the inhabitants, and medical men and veterinary surgeons should assist in instructing the public on the symptoms of the disease both at its commencement and when it is fully developed.

If the owner is aware that the sick or suspected creature has been bitten by a rabid animal, his precautions should be still more strict, and if the animal develops more serious symptoms, the services of an expert should be secured, the police authorities informed, and if there is any doubt, the animal should be at once sacrificed.

MAD ANIMALS, OR THOSE WOUNDED BY THEM.

The following measures should be rigorously enforced :

1. That dogs suspected of or attacked by rabies, or one that has been bitten by a rabid animal, should not be killed at once and buried, unless it is positively ascertained that no person has been wounded by it.

2. If a person has been bitten by an animal really affected with rabies, or suspected to be affected with that disease, it should only be killed if the malady is unmistakably present.

3. If it is only a suspicious case it is well not to kill it immediately, but to keep it confined and under close surveillance, so as to be able to verify the true state of the animal's health. If the animal should be rabid, then it must be killed and buried.

4. If an animal suspected of or affected with the disease escapes from its owner, or from a locality, or if an animal of this description is seen in a locality, the police should be immediately warned. They, in their turn, should, without causing alarm or fear, instruct the public, and warn them ;

under such circumstances, all children should be watched, and dogs and other animals ought to be confined and kept from strange dogs. All wandering dogs should be confined or killed. Every means must be adopted, with due precautions, to capture the mad or suspected animal. If really rabid it should be killed. If only suspected, its life may be spared, in order to ascertain its true condition.

This is all the more necessary if any one has been bitten, for if the animal is healthy the person bitten is relieved from the terror and mental suspense generally experienced by those in that condition. The period during which it should be kept under observation, should certainly not be less than four months.

In every case, and under all circumstances, the local authority should take exact note of these occurrences, and particularly endeavour to discover the domicile and the owner of the animal, and learn whether any person or animal has been attacked or wounded by it in the locality or elsewhere. As mad dogs run great distances, especially at night, the regulations and restrictions should be applied over a wide extent of country, and neighbouring districts should be warned. Hertwig tells us that he has observed that dogs belonging to peasants or persons living in the country, and running at large without supervision into the towns, were the chief instruments in the extension of the scourge. The announcement made to the inhabitants of the surrounding districts should mention the county towards which the animal is probably proceeding, or the direction from which it came, and a description should be published of the animal with regard to breed, size, colour, and other distinctive characteristics. A register should be kept containing the names of owners of dogs, with the number of animals they keep, their sex, and purpose for which they are kept; all sales, transfers, exchanges, or deaths must be duly notified

to the authorities. When muzzles are worn it is above all things necessary that it should fit the dog's head in such a manner that it cannot bite through it or slip it off. A muzzle too small is most objectionable, as it may irritate the animal, and cause it great discomfort, while one too large may allow the dog to inflict wounds. If the wearing of muzzles is ordered, the police should see that every dog has one of proper size, and any wilful infraction of this most essential regulation should be punished by a fine.

The destruction of dogs must be carried out assiduously. No dogs should be allowed to be at large, and all stray dogs should be caught and killed immediately if without a muzzle; but if at large with a muzzle on they may be kept for three days; if wearing a collar with the owner's address they might be returned and a fine imposed. In all cases neglect of the sanitary orders should be severely punished. All dogs bitten by those which are mad or suspected, or which have been in immediate contact with them, should be destroyed, or sequestrated for a proper period. It is certainly a painful proceeding to kill all suspected animals, for the dog is a creature to which man is attached by a sentiment of affection, frequently of the strongest kind; to many it is the favourite of the family, especially of the children, and often a cherished *souvenir*. Our better feelings and admiration for the most affectionate and devoted of animals would not prompt this *dernier ressort*, but for the dreadful character of rabies, and the great danger to which the human species and other creatures might be exposed by leniency. The value of the dog is too small, and the danger too great, to admit of any exception being made. Experienced men ought to be employed in capturing and destroying animals. When captured they should be gently dealt with, and all cruelty should be studiously avoided. They ought not to be lead or dragged along, but put into a covered cart

or wagon, with separate compartments for each animal, to prevent fighting and subsequent danger, for if put together in one place it might happen that a rabid dog might be among the number, and wound the others, some of which might be claimed by their owners and set at liberty again. Life should be extinguished as promptly as possible, the avoidance of pain being studiously inculcated. Science offers us the choice of efficient poisons, as certain narcotic vapours —chloroform, bichloride of methylene, etc., but nothing can be more effective and humane than the administration of strong, newly prepared prussic acid. Instruments must occasionally be used, when poison cannot be obtained.

We do not conceal from ourselves that numerous difficulties oppose themselves to the application of one or other of these measures, but they are nevertheless absolutely necessary, and if applied with vigour would ultimately bring about the total extinction of the rabific contagion. Sequestration is only too frequently an uncertain measure, while immediate slaughter of suspected animals is, for the people, a condition of absolute security. We believe that humanity points out the course to be adopted. It is better that dogs should die than mankind. If the sentiment of humanity does not speak loud enough to inspire and cause to be followed by every one the line of conduct above indicated as the best, there is an excellent means of determining the owners of suspected dogs to sacrifice them, that is, to make the responsibility for the damage and disaster their animals may cause weigh heavily upon them.

DISINFECTION.

All the slaughtered dogs should be buried in a place set apart for the purpose, and at a good depth, the skins should not be removed from their bodies, but should have large cuts made crossways in them, and they ought never to be

thrown into ditches, ponds, or streams, as is so frequently done. All the wood-work, straw, shavings in connection with kennels should be burnt or thoroughly soaked with carbolic acid, Condy's fluid, or some other powerful disinfectant.

The floor of the kennel, stable, or place in which the animal has been kept should be well scrubbed with boiling water, and covered with quick-lime, or any agent noted for its power in destroying contagious matter.

The same should be done with the walls of the place as high as the dog could reach. The chain that attached the animal, and other iron work which may have been in contact with it, should be heated in the fire, and all necessary precautions adopted, as in diseases which are communicable by a fixed or even volatile contagium.

With reference to disinfection, it may be worth referring to Hertwig's experiments. After giving a number of dogs the saliva and blood of rabid animals without result, he put five of them into kennels where mad dogs had been, put the collars of these upon their necks, attached them by the same chains, made them lie down upon the same straw, but yet none of them became rabid.

DURATION OF POLICE REGULATIONS.

With regard to the length of time during which the police regulations should remain in force, there is no definite rule. Knowing the limit of the period of incubation, it might be inferred that the sequestration of dogs should extend to that period. In Saxony, where the dog-laws have been rigidly carried out, it has been found that three months was generally an effective interval, though, if new cases occurred during this time the period was dated from them. Notwithstanding the inconvenience and annoyance oftentimes occasioned by the restrictions imposed for so long a period,

yet those who suffer most from them should bear in mind the great interests that are at stake, and cheerfully aid the authorities in their endeavours to suppress a contagion which causes such terrible destruction and alarm ; the more strictly judiciously-framed veterinary police regulations are obeyed, the sooner will the course of pestilence be terminated, and the less will its ravages be felt. The same police regulations are applicable to rabid cats—they ought to be at once killed, and all other dogs or cats bitten by them destroyed.

MEASURES TO BE ADOPTED WITH OTHER ANIMALS THAN DOGS.

We have already made some allusion to the measures to be adopted with other domestic animals, and we have now to complete our observations. In the last century, and perhaps even now—for in this country there are no veterinary police regulations for this disease—the same severe measures were sometimes applied to other domesticated animals as to the suspected dog, through ignorance of the disease as it affects them, as well as indiscrimination, and they were generally killed at once or left to chance, as the case might be. In dealing with them it must be remembered that they are not like the dog, our constant companion, and that their natural weapons of attack are different, so that they very rarely extend to contagion ; and, in reality, veterinary police regulations should have chiefly for their object the health of the animal while alive, and its destruction when diseased. When these animals have been in contact with or bitten by a rabid or suspected dog, the circumstance should be reported ; they should be visited by an expert as quickly as possible, and their bodies carefully examined, particularly the ears, mouth, and nose, the limbs, and tail, in order to discover if there are any wounds, even of the most trivial description. Those discovered to be wounded should be at once isolated and

carefully watched. Preservative treatment may be recommended, but, of course, cannot be ordered. Haubner states that the isolation of wounded animals is unnecessary, as nothing is to be feared from them should they become mad. Röll says separation and medical treatment is necessary unless the proprietor decides to kill them. But, as will be seen from our previous description of the symptoms, all rabid animals, including the dog, cat, fox, and wolf, of course are more or less dangerous to others, or to mankind, and particularly the horse ; even the sheep may become so at times. It is better, therefore, to separate the suspected from the uncontaminated, and to place them under veterinary or police observation.

Such animals as horses, oxen, and other beasts of labour, should be permitted to work in the immediate vicinity of their homes, but they ought not to be allowed to travel far beyond this on any pretext. If a mad dog has been among a herd of cattle or flock of sheep, the whole herd or flock should be placed under surveillance.

None of the domesticated animals, other than those referred to, if bitten or suspected, should be sold, bartered, or removed within a period equal to the limits of their several periods of incubation.

Röll gives four months for the sale of horses and cattle, but for other animals used as food, the minimum may be three months.

Haubner gives the period of supervision as two months for sheep, three months for pigs and horses, and six months for cattle, and we should prefer this as a basis for regulating the restriction to that of Röll. At any rate, it is a great mistake to make the quarantine the same for all animals ; this should be regulated by the average duration of the incubatory period in the different species. The immediate slaughter of all the bitten animals is unjustifiable, as only

about 50 per cent. take the disease, and, when compared with dogs, the danger is very trifling, even when rabies manifests itself. It is, therefore, time enough to resort to slaughter, when the disease shows itself, unless the owner is desirous of avoiding the risk of loss, and wishes to sell the carcase for food.

As soon as the disease manifests itself, notice ought to be given to the authorities, and an examination made by a veterinary surgeon, when, if it be ascertained that rabies is really present, and the owner does not object, the animal may be killed. All animals in which rabies is confirmed should be slaughtered, and no attempt at treatment permitted except under the restrictions before mentioned.

The carcase must be buried intact, with the skin slashed profusely. Haubner admits that if with rigor mortis the virulence of the contagium is extinct, then skinning might be allowed if conducted with care, and the skins utilised. Should the carcase chance to be dug up and eaten by animals there is no danger to be apprehended, according to Haubner; but Lafosse says the dead bodies should be covered by at least four feet of earth, and the burial places guarded from carnivorous creatures.

DISINFECTION.

Everything used with rabid animals was at one time destroyed, but neither observations nor experiment, as we have shown, warrant such a measure. The same means of purification may be resorted to as have been prescribed for the dog.

THE FLESH AS FOOD.

Haubner says that the slaughter of animals for food may be permitted within twenty-four hours after the bite of a rabid creature, but the injured portion must be cut out and destroyed. Even after this time killing an animal for the

sake of its flesh may also be permissible, provided the flesh be consumed by the owner, and not offered for public sale, as the sentiment of the consumers must be consulted.

MILK.

According to the same high authority, forbidding the use of milk derived from bitten animals is wrong until the disease appears. It may be given to other animals, and the owner of the cattle might use it. Butter and cheese might also be made from it until it was ascertained whether or not the animal had been successfully inoculated with the rabid virus.

People have remained healthy, even when using the milk at the commencement of the disease, but our researches prove that both flesh and milk are dangerous when the malady is developed.

RÉSUMÉ OF PREVENTIVE MEASURES.

The measures to be recommended for the prevention of rabies and its extension to the human species may be comprised under the following heads:

A. The owners of dogs and other animals should be made to understand the responsibility that rests upon them with regard to the health of their animals, particularly when contagious diseases appear among them.

B. The number of useless dogs should be diminished as much as possible, and a tax should be levied on all dogs.

C. Every dog should wear a collar with owner's name and address engraved thereon, as well as a particular mark impressed by the licensing or police authorities, for the proper registration and identification of the animal.

D. All stray dogs without the collar or the owner's name and address thereon should be captured, and, if not claimed within a limited period, sold or destroyed; and dogs stray-

ing with the proper collar on may, where circumstances render it necessary, be seized and confined or returned to the owner, who pays expenses and is fined if need be. Bitches in rut should not be allowed to go at large at any time.

E. Unless under special circumstances, as when rabies is prevalent, or when certain animals are vicious, the muzzle should not be worn.

F. The owners of dogs should be held responsible for the damage done by them.

G. Diseased dogs, or those which show the slightest symptoms of disease—altered habits, etc.—should be carefully watched, and precautions adopted. If the symptoms of rabies appear, the circumstances should be reported to the police by the owner or attendant on the dog, or other persons who know of its condition. Neglect of this should be estimated as a criminal offence. The police should know the early symptoms of the disease.

H. If other animals which have been in contact with or bitten by a rabid dog become unwell afterwards, the symptoms ought to be noticed, and should they lead to a suspicion of rabies the creatures must be isolated, and their condition reported to the police.

I. Suspected animals should not be killed at once if they have bitten any person, but only destroyed when the disease is unmistakably present.

J. A mad or suspected dog escaping from its owner, or appearing in a district, should be the signal for alertness, and those who know of the circumstance ought to warn the police at once. Children should be guarded and animals confined or kept from strange dogs. All wandering dogs should be confined or killed.

K. Rabid dogs should be killed, or, if suspected, they may be kept until their condition is ascertained.

L. The police authorities should endeavour to obtain every information about any rabid or suspected dog, and to discover the name and address of its owner, learning also what damage it may have done. Regulations and restrictions should be extended over a wide space of country, and neighbouring districts should be warned. All information necessary to put the inhabitants on the alert ought also to be given.

M. When the disease appears in a virulent or epizoötic form, all measures ought to be rigorously enforced. Owners of dogs should give due notice of all changes occurring among their animals. Muzzling may be necessary, but the muzzle for each dog should be properly and securely constructed, and sufficient in size without being too large. It must have appliances for attaching it firmly to the head.

N. The destruction and confinement of dogs must be assiduously carried out, and heavy fines or imprisonment should be imposed upon those who attempt to evade or neglect the regulations.

O. Dogs should be slaughtered with as little cruelty as possible. They ought to be buried deeply in the ground.

P. Disinfection should be carried out as with other contagious diseases.

Q. The police regulations and restrictions should be continued for some months beyond the appearance of the last case of rabies. This period should be dependent on the limit of the incubatory stage of the disease in the dog.

R. With regard to other animals when wounded by a suspected or rabid dog, the circumstance should be reported, and steps taken to ensure safety. Horses, oxen, and other working animals, may be employed in the immediate vicinity of their homes, but must not be sold, bartered, or remove within a certain period. The immediate slaughter of wounded or suspected animals is not necessary, but as soon as rabies manifests itself notice should be given to the local authori-

ties, and the necessary steps taken to prevent damage. The bodies should be buried intact, though, under special circumstances, skinning them may be allowed, in order to tan or dress these parts.

S. Disinfection to be resorted to as in the case of rabid dogs.

T. The flesh is not dangerous as food until the symptoms of the disease have appeared. If used before this period certain precautions should be adopted.

V. The milk may also be utilised during the same period.

X. Competent veterinarians must co-operate in the execution of these measures.

CHAPTER X.

CURIOSITIES OF TREATMENT AND LITERATURE.

Dr. Berkenhout, writing about rabies in 1783, tells us that he knew not of any human attempt which bears a better resemblance to the Knight of La Mancha's attack of a windmill, than that of combating vulgar errors; of reasoning against received opinions. If the worthy physician lived in the nineteenth century, and read the popular literature of the day, he would have been astonished at the persistency of popular prejudice and ignorance.

Correspondents have vied with each other in raking up old opinions and old remedies, and dressed up in new shapes, have offered them as new suggestions for treatment. In order to gratify curiosity, and to show what has been done by our ancestors, we have collected from a number of monographs some interesting details, and we are particularly indebted to Lipscomb for some of our information.

He tells us, it is useful to examine what has been already done, both for the prevention and cure of the disease, because, without knowing the discoveries of our predecessors, it is impossible to distinguish between alteration and improvement, or to separate originality from plagiarism. Most of the old remedies obtained a repute because there was no proper distinction made between persons who had been

merely bitten by an enraged animal and those who were really suffering from rabies.

Dioscorides recommends burnt river-crabs, the bitten parts to be extirpated, scarification, cupping, and burning by fire, and salt meat to be applied to the wound. Hellebore was his favourite remedy; he also recommended madwort. He mentions that Themison had the disease and recovered.

Scribonius mentions an amulet used in Crete by Zopyrus, a piece of hyena skin bound on the left arm by the person bitten. We are also indebted to him for the antidote of his preceptor Apuleius Celsus. It consisted of nard, saffron, myrrh, pepper, cinnamon, opium, and other drugs; it was to be taken for thirty days to prevent the disease which he observes, brings on death with great agony, and of which no person was ever known to be cured.

Celsus, from whose writings there is a favourite quotation in every book on rabies, advised cupping, the hot iron, emollients; when the cautery could not be applied, corrosive medicines were to be used; he refers to the use of the warm bath, but in his opinion there was only one remedy. The patient is to be suddenly thrown into a pond, and if he cannot swim he is to struggle in the water, and be suffered to sink, being occasionally raised so that he may be compelled to drink. If he can swim he is to be forced under water that he may be made to drink, and thereby be freed from the thirst and dread of water at the same time. He considerately adds that weak people are in danger of convulsions from this sudden submersion, and therefore, directly after it, they should be put into a bath of warm oil.

Pliny informs us, that the bite of a mad dog, until about his time, was considered incurable; he mentions a great variety of remedies—the dog-rose, which cured a Roman soldier, and which was revealed in sleep to the man's mother; sheep's wool and the ashes of a dog's head to be applied; the

liver of the mad dog which bit the patient to be eaten raw if possible, otherwise, if the patient were delicate, it should be boiled a little. His stock of remedies was almost inexhaustible. He tells us of goose-grease, honey, fish-brine, nitre, fuller's-earth, garlick, rue, horehound, *fleur-de-lis*, fig-tree leaves, bitter almonds, the hair of a man's head, calves'-feet, colewort, as applications to the wound. He also says there is under the tongue of a mad dog a slimy saliva, which being given to those who are bitten, prevents rabies, and that the worm in the tongue called "lytta" should be carried three times around the fire, and then eaten. He does not forget the actual cautery, which he says gives immediate relief even after rabies has developed.

Thrasyllus had a preference for the river cray-fish, and Galen celebrates the efficacy of river-crabs; his preceptor, Æschrion, prepared them with method. They were burnt alive on a copper plate, and then finely powdered. This process was always performed in the summer, after the rising of the dog-star, when the sun had entered Leo, and the moon was eighteen days old. Galen also mentions the antidote of the great king, Mithridates, which was supposed to consist of forty different remedies, but if we are to believe Samonicus, when Pompey took the baggage of the Pontic King, the prescription of the famous antidote consisted only of twenty leaves of rue, two figs, two walnut-kernels, to be eaten together with a grain of salt each morning. Galen enumerates the remedies of Cratippus, Belchionius, Zeno, Claudius Apollonius, Menippus, and Menelaus, which were all of a similar character. Berkenhout states that Andromachus, a cotemporary of Galen, composed an antidote of more than sixty ingredients—it was called a Theriaca, from the Greek word for a wild beast—as a preventive against the bite of mad or poisonous animals.

This notable hodge-podge is said to be found in the London

Dispensary. Berkenhout accounts for the invention of theriaca as a trick of some arch apothecary's apprentice, rather than on the idea that in so great a number of ingredients it was possible some of them might hit the mark, for the same reason that some sportsmen prefer a number of small shots to a single bullet. We may pass over Oribasius, Ætius, and several others, until we reach Paulus Ægineta and Avicenna. The former described the appearance of a mad dog very correctly; his remedies were simply copies of those of Galen.

Avicenna directed the wound to be dilated and kept open forty days, cupping, plasters of pitch, vinegar, opoponax, corrosive applications, the actual cautery. His internal remedies were those used by the Roman physicians, such as coagulum of a hare, Alexandrian and Lemnian earths, gentian, bayberries, myrrh, birthwort, amomum, rue, wormwood, cantharides, pepper, cloves, cinnamon, powder of burnt crabs, and the liver of a mad dog. Avicenna also mentions giving drink by means of a tube put down the throat.

Omitting the remedies of Varignan, Fernelius, Fabricius Ab Aquapendente, Matthiolus, we reach Van Helmont. He follows Celsus, and relates a very curious narrative of a cooper of Ghent who was taken out to sea, naked, bound with cords, and a weight on his feet. Van Helmont asked the mariners what was the object of this spectacle, and was told that the old man had been bitten by a mad dog, and they were taking him out to sea to dip him in order to cure him. Van Helmont witnessed the ceremony, which consisted in letting him down headlong into the sea, and keeping him under the water during the time a Miserere was said. He was then lifted out, and twice plunged in again, whilst the prayer called the Angelical Salutation was repeated.

Berkenhout observes upon this, "Some profane readers

may possibly feel inclined to comment ludicrously on this *spatium* Salutationis Angelicæ, but choosing rather to treat the matter seriously, I requested a friend to read over the Miserere, and found by my stop-watch that he performed it in one minute and thirty-five seconds, and the Salutatio Angelica in ten seconds."

"Van Helmont is not sufficiently explicit in this important part of his narrative. Whether this was only a method of computing time, or whether these psalms were actually repeated during the immersion, does not appear. I am inclined to think they were; if so, this capital omission in our old women on the sea-coasts sufficiently accounts for their fallibility." Van Helmont concluded the man was killed, but the sailors ridiculed his apprehensions, for when the patient was released from his bonds, he revived and ultimately recovered.

The mariners also told Van Helmont that a salt herring immediately applied to the wound was an infallible cure for the bite of a mad dog, and that half drowning in salt water was only necessary when this remedy had been neglected, so that, as Berkenhout observes, we have neither the authority of Celsus, nor the practice of the Netherlands, to plead in favour of sea-bathing as a preservative.

Ambrose Paré recommended garlic and the actual cautery; and the wound to be kept open until the fortieth day.

Hildanus applied the actual cautery deeply and effectually; and with great propriety and judgment, admonishes young surgeons to be very attentive in this particular, lest any infectious matter should remain in the wound. A violent disease, he adds, according to the old proverb of Quintus Curtius, requires a violent remedy. He kept the wound open, administered theriaca and a stimulant called Potio Lüchtenbergiana. We next arrive at the famous powder of Palmarius. This famous recipe was obtained from Sylvanus Count de

Pyrou, and was composed of equal quantities of rue, vervain, sage, plantain, polypody of the oak, wormwood, mint, mugwort, balm, betony, St. John's wort, and centaury, which, being mixed, were to be taken daily in the dose of a drachm or a drachm and a half.

We may pass over Parkinson, Boerhaave, Boccone, and linger for a moment on Desault, Mead, James, Cheyne, Douglas, Sauvage, and Delasone.

Mead proposed bleeding in large quantities, preparatory to giving his favourite powder, which he deemed an infallible specific. This powder, known by the name of Pulvis Antilyssus, was made from a recipe of a Mr. Dampier, in whose family it had been kept a profound secret for many years, and the composition of which was first published in the *Philosophical Transactions*, No. 237, and was placed in the *Pharm. Lond.*, 1827. It was made of two parts of English ash-coloured ground liverworts, mixed with one part of black pepper, and was directed to be taken in doses of a drachm and a half in a pint of cow's milk, every morning. Mead believed it was an infallible specific, and says "that he cured a thousand cases with it." It enjoyed a high reputation for the reasons pointed out by Jesse Foote in an essay published in 1793. Foote believed that excision by a knife of the bitten part, was the only sure and certain method of prevention. He insisted—

1st. That every medicine that ever was given for the prevention of rabies had failed.

2nd. That although many who have taken medicine have escaped from infection, it ought not to be attributed to the power of the medicine, because many have died, notwithstanding the use of boasted specifics.

3rd. That of many who are bitten, few are actually infected, owing to the bite being made through clothing, and that they have escaped by the infecting fluid of the dog being

wiped away by the teeth passing through the clothing, or by some other fortunate circumstance.

4th. That as some medicine or other is indiscriminately given to every one who is bitten, so every one who is not actually infected by the bite does well, as every one who is actually infected by the bite dies; and as there are few instances of the latter in comparison to the former, thus it is that the reputation of a cure by prophylactic or preventive medicines has been supported, when, in fact, the safety or the danger of the patient has been dependent upon another circumstance, which is, whether he was in consequence of the bite actually infected or not.

5th. That if the patient were not infected he would do well, whether he took any medicine or not; but if he were infected it would be fatal whether he took medicine or not. These reasons account for the favour enjoyed by certain vaunted specifics, and with all the progress made by education and by the evolution that should have taken place in the human brain, we have evidence at the present time that human credulity is as weak in the present day as it was, not only in the time of Dr. Mead, but in the days of Mithridates.

Mercurials were recommended by Desault, James, Cheyne, Douglas, Sauvage, Delasone, and Lipscomb, but as we have seen from our statistics, they have not been successful. Dioscorides, Celsus, Galen, Ætius, extolled sucking the wound, and Latta and Berkenhout revived the idea. The latter, in his pamphlet written in 1783 (page 74), commemorates the heroism of his own daughter, who, with affectionate intrepidity, sucked the wound of her brother, aged eight years, who had been bitten by a dog on the thigh, as she had heard her father say it might be done with safety. Lipscomb informs us that this practice originated from a very early period, dating from the days of Cleopatra, and was rendered famous in England in the thirteenth century by the heroic exploit of

the affectionate Eleanor, who, as history relates, sucked the wound of King Edward I. Sucking the wound seems to be almost an instinctive act, and is unattended by danger if there be no wound or abrasion of the mucous membrane. Amongst other remedies we may mention those of Hill, an apothecary at Ormskirk. This celebrated preparation enjoyed a considerable repute; it was analysed by Lewis, Black, and Heysham, and consisted of the follow ingredients: Chalk, Armenian bole, alum, elecampane-root, and oil of aniseed.

The tonquin medicine was brought home by Sir George Cobb, and was reputed infallible amongst the Chinese. It was composed of native cinnabar, cinnabar of antimony, of each twenty-four grains, with sixteen grains of musk, and was administered in a glass of rum, arrack, or brandy.

Jesse Foote, in an appendix to one of his pamphlets, furnishes us with an account of an experiment made at Florence. It was communicated by M. J. Fabbroni, assistant director of the Cabinet of Natural History of his Royal Highness the Grand Duke of Tuscany, sec. Royal Acad. of Agriculture of Florence, to Sir Joseph Banks.

Jesse Foote thus expresses himself on it: "I shall give my opinion of this practical experiment in a few words. I think it the highest vanity of idiotism, a disgraceful insult upon human understanding, and a prostitution of the journal in which it was inserted."

Fabbroni says: "The experiment was indeed somewhat bold, but in the horrid and hopeless state to which the unhappy patients in such cases are reduced, everything seems to be allowable." These words were written in 1788, and they read very much like the words repeated in one of our contemporaries in the year 1877.

"In presence of a malady which constantly terminates in death," says Dr. Charteris, quoting from Trousseau, "the

practitioner's duty consists in boldly trying everything"—*nous verrons*. In this interesting experiment on the principle laid down above, a viper was applied to each of the patient's legs, and at the very instant of the bite, the symptoms seemed to increase in violence, but this was only momentary, as he immediately became more calm and collected, gave an account of his relations, asked for somewhat to drink, and even drank, but died within half an hour. The narrator gravely continues: "This experiment did not seem to be at all conclusive, either for or against, but it occasioned so much popular clamour, that I think it will hardly be repeated here, at least on a human subject." We need not make any comment upon this scientific experiment, but by a natural transition pass to some of the grosser superstitions in connection with the treatment.

Some of the grosser remedies have been collected by Dr. Holland in the lectures we have previously mentioned. The *menu*, if not *recherché*, is rare, consisting of pounded ants, badger soup, the excrement of a calf, the brains and comb of a cock, cuckoo soup, carral, the blood and purified excrement, liver, urine, the worm under the tongue of a mad dog, flies, the liver of a male goat, horse dung, menstrual human blood, the tail of a shrew mouse, male oyster-shells, and the flesh of the unicorn.

Still grosser superstitions exist in reference to smothering—an historical mode of death familiar to the readers of history in connection with Edward V. and his brother, whilst Shakespeare has immortalised it, by making Othello, through jealousy, smother Desdemona. On some such plea as the words uttered by Othello, suffocation was resorted to

> "I that am cruel am yet merciful:
> I would not have thee linger in thy pain."
> Act v., Scene ii.

There are not only traditions of the suffocation of the

unfortunate victims between feather beds, but we have evidence of the existence of the custom. We have selected a few cases from *Notes and Queries.*

In the *Dublin Chronicle*, 28th October, 1798, the following circumstances are recorded. A fine boy, aged fourteen, was bitten by a lady's lap-dog at Blackrock, near Dublin. In about two hours the youth was seized with convulsive fits, and shortly after with hydrophobia; and notwithstanding every assistance, his friends were obliged to smother him between two feather beds (*Notes and Queries*, 2nd ser., vol. ix. p. 454). We need only say this was not a case of rabies, as it never develops within such a period, and as for the authenticity of the statement we do not vouch.

There is a most circumstantial account of a similar murder in the "Personal Sketches" of his own times by Sir Jonas Barrington (vol. iii. pp. 42–48).

The writer says: "They" (the Irish) "did not regard it as a murder, but absolutely as a legal and meritorious act, to smother any person who had arrived at an advanced stage of hydrophobia."

The narrator then details the case of Daniel Dempsy, who was subjected to this process in 1781, with the sanction of Mr. Palmer, a magistrate; and the sufferer having undergone this doom, a Mr. Calcut, coroner, held an inquest, when a verdict was returned that Daniel Dempsy died in consequence of a mad dog.

The following appeared in the *Annual Register* of 1722, p. 121: "Four persons were tried at York Assizes for smothering a boy, who had been bitten by a mad dog, between blankets. They are said to have been acquitted for want of evidence."

The volume for 1766 contains, at p. 57, an account of a remarkably horrid murder by a husband of his wife on their bridal night, which occurred in the district of Avignon. It

was thought the man had a sudden outbreak of hydrophobia, but it was more probable one of acute insanity.

In the morning the persons who discovered the murder thought it expedient to shoot the unhappy man, which was done on the spot (*Notes and Queries*, 4th ser., vol. iv. p. 358).

This case is somewhat similar to the one related by Mead as occurring in Scotland. A young man was said to have been bitten by a mad dog, and married the same morning. "He spent," the narrator says, "as is usual, the whole day till late in the night in mirth, dancing and drinking. In the morning he was found in bed raving mad; his bride (horrible spectacle) dead by him, her belly torn open by his teeth, and her entrails twisted round her bloody hands." This case, if true, has not the slightest claim to be considered one of rabies.

In the *Annual Register* for 1830, p. 102, it is also narrated that a young peasant girl, in the parish of Killenag, a remote part of the county Galway, was bitten by a rabid dog, and in two days manifested unequivocal symptoms of hydrophobia. Her parents procured two feather beds, and smothered her.

A Mr. J. B., hailing from the Temple, makes the following observations on this case: "No doubt by our law the act was murder . . . . even allowing that the act is morally wrong, and that we have no right to shorten the life of a fellow-creature by a single day to save him any amount of torment, yet no legal sophistry can delude us into the belief that an act which would be the purest humanity to a dog or a horse was one of malice aforethought if committed on a child racked with the tortures of hydrophobia or madness" (*Notes and Queries*, 5th ser., vol. iv. p. 91).

These are rather latitudinarian doctrines; but we believe there are some advocates of the present day who also incline

on the grounds of humanity and economy, to the putting to death of idiots, imbecile, and very old people. Mr. G. R. Jesse, Hendbury, Cheshire, in *Notes and Queries*, vol. x. p. 382, also informs us that sufferers were bled to death or smothered. "A man in the Revolution murdered his brother under this pretext. Daniel's 'Rural Sports' mentions, I think, an instance of smothering rabid patients between feather beds, and that the parties were tried and acquitted. See likewise Scot's 'British Field Sports,' 1818, p. 196, for a case of bleeding to death; in the same disease, people appear to have been poisoned or drowned. There are many local traditions also in regard to this smothering. There was a current belief through the North of Scotland sixty years ago, that a Countess of Fife, about the end of last century, or the beginning of the present, while fondling her lap-dog, had been bitten in the lip, and was seized with hydrophobia, and, when all hope of cure was at an end, was smothered between two feather beds."

Coming down to a more recent period, in the *Irish Times* of May 18th, 1861, the following startling announcement appeared:

"CASE OF HYDROPHOBIA: MELANCHOLY OCCURRENCE.—A fatal case of hydrophobia is reported from Newport, county Tipperary, the victim being a fine young woman. It appears that while being engaged in some out-door employment a neighbour's dog bit her in the hand. Hydrophobia in its most fearful aspect set in, and she became so hopelessly mad, that it was found necessary to smother her between two feather beds" (*Notes and Queries*, 2nd ser., vol. ix. p. 478).

In the *Guardian* of April 3rd, 1867, it was also said to be announced that a little daughter of Mr. A. Woodruff, of the town of Greenfield, Michigan, having been seized with hydrophobia, a consultation was held by the physicians, who

decided that as the patient could not possibly survive, every consideration of humanity demanded that her sufferings be ended by some means, in accordance with which the child was smothered to death (*Notes and Queries*, 3rd ser., vol. ii. p. 376).

The *London Magazine*, 1738, p. 44, gives the case of a man named Brousell, a labourer who was supposed to be suffering from hydrophobia; he begged that he might not be smothered but bled to death. He, like Seneca, was an epicure, and his request was accordingly complied with (*Notes and Queries*, 2nd ser., vol. i. p. 363).

We may pass from smothering to an instance of the tenacity with which the uneducated cling to old superstitions. We also learn from *Notes and Queries* (1st ser., vol. x. p. 469) that, at an inquest held in October, 1866, at Bradwell, Bucks, on the body of a child who had died from hydrophobia, evidence was given of a practice almost incredible in civilised England. A witness stated that she had fished out of the river the dead body of the dog which had inflicted the bite, taken out its liver, fried a bit of it on the fire, and given it to the child to eat.

Old world traditions and old stories seem linked together, and their common origin has been well illustrated by some modern writers, especially as regards Scandinavian myths. The blood of rabid animals has been recommended by the physicians of Finland. Dr. William Ruthmeister, of Powlock, Finland, has collected a multiplicity of striking cases, as a proof that the blood of a rabid animal when drunk is a specific even when the symptoms are most strongly marked. The rabid wolf, dog, or other animal, is killed, the blood drawn off, and collected as an antilyssic ptisan. Dr. Stockmann, of White Russia, confirms Ruthmeister's account, and states the practice is equally common and successful in his own country.

We have seen how it has been recommended by other nations. In connection with the animal, there is a practice common in Ireland, and perhaps in England. Every one has heard of the expression, "Have a bit of the hair of the dog that bit you?" This phrase is at present commonly applied when, after the excesses of a previous evening, a morning B. and S. is recommended as a corrective. In Ireland it is a regular custom to cut a piece of the dog's hair off and apply it to the wound, and we find the same remedy mentioned in Etmullerus, 1699, who says: "Let the hair of the mad creature, if it can be had, be laid upon the wound;" but he adds, as a corrective for this nonsense, that the "most safe and more speedy remedy is burning with an actual cautery."

There are many superstitions as to the method of telling whether the animal which inflicted the wound was mad or not, and many old writers suggest that the wound be rubbed with a crumb of bread, so that it may become impregnated with the moisture; if a dog will thus neither eat nor smell it, it is a sign the animal was mad.

In reference to the power of curing, Mr. Francis Robert Davis writes to *Notes and Queries* (1st ser., vol. ix.) that a man named Monsel, living at Kilrush, in the county Clare, possessed a cure for hydrophobia which was never known to fail. He required that the patient should be brought to him nine days from the time of his being bitten, when he made him look into a pail of water, or a looking-glass. If he bore that trial without showing any uneasiness, he declared there was no doubt of his being able to effect a cure. He then retired to another room, leaving the patient alone for a short time, and when he returned he brought two bits of cheese which he said contained the remedy, and caused the person to swallow them. He then desired him to return home, and for nine days fre-

As an illustration of what curious superstitions still lurk amongst rural populations, the *Students' Journal*, 1877, mentions that at Rivesaltes, in the south of France, some terrible cases of hydrophobia have recently occurred. The local authorities, therefore, determined to adopt preventive measures, and accordingly sent for some *salondadons*, or, as we should say, *seventh sons*, who in those districts are believed to have the miraculous power of curing the bites inflicted by mad dogs, and of blessing small pieces of bread called *passagnats*, which are supposed to ward off hydrophobia. The *salondadon* performs his cures by means of a crucifix, uttering the while sacramental words from a liturgy peculiar to himself. The seventh sons are supposed to have a variety of other powers not granted to ordinary mortals, such as treading under foot or applying to the tongue a bar of red-hot iron without receiving any injury.

Holland collected a record of the medicines used and divided them into different classes. Under the heading "Plants, vegetables, woods, barks, either solid or in an infusion," we find no less than 228 different substances. We need not enumerate them all, but may dwell on a few of the more noted ones.

Madwort and various forms of lichens were favourite remedies. The root of balanstrium, with storax, cypress nuts, soot, olive oil, and wine, was the receipt, according to Bonaventura, of Cardinal Richelieu. Belladonna was first tried by Trugnet, of Magerne, who published a monograph on the subject. Beetroot, box-leaves, cabbage, cucumbers, black currants, digitalis, euphorbia, were also fashionable.

Marochetti tells us the Russians used genista sentoria, which they looked upon as a specific. Rose-leaves were used internally, and as a poultice, in Greece. Ergot-of-rye was recommended by Thacker, in doses of 180 grains, with 240 grains of calomel.

In the next division, alkaloids, extracts, oils, etc., derived from the vegetable kingdom, and used internally. We have a formidable list, amongst the most prominent of which are atropia, assafœtida, elaterium, gamboge, nicotina, opium, croton oil, and quinine. Chonski gave two drachms, every second hour, of quinine, and gave one dose of 240 grains. Opium has been administered in large doses, and to one patient, the quantity of 180 grains was administered in fourteen hours.

Under the head of acids, alkalies, salts, bases, simple substances taken internally, there is also a formidable list, amongst which we find antimony, alum, arsenic, copper, iodine, lead, mercury, phosphorus, nitrate of silver, sulphuric acid, tartar emetic, prussic acid.

We have mentioned the word "Lytta," and there is a common expression used, "If you worm a dog, it will not go mad." This is derived from Pliny, and is believed in at the present day as firmly as it was in his time. Dr. Sam. Johnson defined the "worm" as a substance nobody knows what, and extracted nobody knows why. Dogs are wormed at the present day, but as a precaution against rabies, it is perfectly useless.

The curious will find a very interesting discussion as to the existence of hydrophobia in a pamphlet published in reply to letters from a Mr. Lee, by Thomas Whitney, apothecary, Bath, 1807. Mr. Whitney proposes that Mr. Lee should inoculate himself with the saliva, and as vaccination sometimes fails the first time, that he should repeat the operation three or four times. Mr. Lee declined, with thanks.

We must not omit mentioning the alleged specific, zanthium spinosum, an account of which was given last June in the *Medical Press and Circular*. We have collected from various sources the preceding details, from which it will be seen that superstition has largely entered into the domain of treatment. Lipscomb tells us that the dominion of super-

stition is coeval with the practice of medicine. Charms and amulets being the first rudimentary attempts against disease. But not only amongst the inhabitants of rude and barbarous nations are charms in vogue, but they have been cherished as efficacious applications in more enlightened countries. It is not, perhaps, to be wondered at, that our forefathers, in dealing with this disease, should have grasped at any hope of a remedy, or that superstition should have largely entered into the means of treatment. Though we are living in the boasted light of an advanced age, though the schoolmaster is said to be abroad, and education supposed to elevate the masses, yet empiricism is still as rampant as ever, and we have ample evidence of superstition, equal in degree to those of our ancestors. We cannot even afford to smile at the narration of facts in this chapter. The nineteenth century has yet to be judged by the twentieth.

CHAPTER XI.

A SYNOPSIS OF RABIES IN ANIMALS.

THE origin of rabies amongst the lower order of animals, as the canine and feline species, is frequently obscure and involved in doubt. The disease in man depends on the disease in such animals as the cat, dog, wolf, fox, etc. In man it never has a spontaneous origin. This opens out the much-contested question of the spontaneous origin of contagious diseases.

THE SPONTANEOUS ORIGIN OF RABIES.

For many years, and even now, the spontaneous origin of rabies, in those animals in which it is most frequently witnessed, has been denied by authorities who believe that contagious diseases are propagated and maintained solely by the transmission of a specific virus from the diseased to the healthy, and that no transmissible disease ever arises spontaneously, but that its infecting element is always in existence. Whatever weight this line of argument may have in human medicine, there can be no doubt whatever that in comparative pathology it cannot at present be positively entertained.

We have come to the conclusion there are few nowadays who are not convinced that rabies will occasionally appear

in a spontaneous manner, and without any certain assignable cause.

No doubt the transmission of the disease by inoculation furnishes by far the greatest number of cases, and 999 out of 1000 are due to contagion; but with our statistics and evidence of its appearance in an epizoötic form in countries where it had been previously unknown, its invasion of localities where it had been entirely absent for years, we are compelled to admit a *de novo* origin.

SUPPOSED CAUSES.

But though we hold the above opinion, we cannot positively explain the cause of its direct or spontaneous development, nor can we advance any positive explanations, derived either from our own observation, or the statistics of eminent writers. We shall briefly review the principal causes which have been from time to time fixed upon to account for its appearance.

INFLUENCE OF CLIMATE.

There is no decisive evidence on this point. It was said that temperate climates suffered most from its ravages; but the appearance of the disease in the tropics militates against this supposition.

INFLUENCE OF SEASON.

The influence of certain seasons in inducing the production of rabies, has long been a popular notion which, it would appear, the stern testimony of facts has not been quite potent enough to dispel. During the hot weather—the "dog days," as a certain portion of the summer has been designated—it has been universally believed that the canine race is particularly liable to be attacked by madness, possibly from the apparent distress dogs manifest when exposed to heat, as evidenced by their restlessness, panting, thirst, etc.

This popular notion that rabies is more common in summer than winter, is of the highest antiquity, and seems to have been connected in some way with the celebration of the festum Cynophontia of the Argives. But is it the case that rabies is more frequent in hot than in cold or temperate weather, or, in other words, that heat induces the disease? The evidence furnished by statistics, compiled in France and Germany, incontestably prove that it is not during hot weather that rabies is most prevalent, but during the cold and mild seasons. We may give abstracts of a few statistics. Lafosse, from the register of the Toulouse Veterinary School from 1843 to 1858, has furnished the following information:

In December,	January,	February -	- 4	cases.
„ March,	April,	May - -	- 16	„
„ June,	July,	August -	- 2	„
„ September,	October,	November	- 11	„

Saint-Cyr's reports of the Lyons Veterinary School is very interesting and instructive. The admissions under treatment for 1865 were as follows:

	Rabid.	Suspected.	Became rabid in the infirmary.	Total Admitted.	Total rabid.
January ...	12	2	0	14	12
February ...	14	4	1	18	15
March ...	6	11	0	17	6
April ...	14	20	1	34	15
May ...	12	14	1	26	13
June ...	6	14	1	20	7
July ...	2	8	2	10	4
August ...	7	3	2	10	9
September ...	1	3	0	4	1
October ...	3	1	0	4	3
November ...	0	0	0	0	0
December ...	1	1	1	2	2
	78	81	9	159	87

We might adduce other statistics, but they are hardly

necessary. We may consider it a fact beyond all dispute that hot weather does not exert any marked influence on the genesis or prevalence of rabies.

The best veterinarians agree that meteorological conditions and the different seasons have little effect in exciting or determining the evolution of spontaneous rabies, and that it is a disease which may appear in any season, and in any kind of weather.

INFLUENCE OF SEASON ON THE HUMAN SUBJECT.

M. Boudin has furnished particulars of ninety-seven cases of hydrophobia in the human subject, and we find they occurred in the following ratio:

In	March,	April, May	- -	25 cases.
„	June,	July, August	- -	42 „
„	September,	October, November	-	13 „
„	December,	January, February	- -	17 „

We cannot place any great reliance on these figures, owing to the difference of the period of incubation in each case, and as the malady had been produced by inoculation, so that rabies may occur at any period of the year, as it depends as a kind of corollary on its existence in the lower animals.

INFLUENCE OF HUNGER, THIRST, AND FOOD.

Hunger and thirst, putrefied food, and bad water, have at times been assigned as a cause of madness in dogs, but with no more show of probability than attends the belief of the influence of seasons and weather. We might cite Turkey, Syria, Egypt, and Africa generally, and India and Australia, as countries in which these animals are much exposed to the torments of thirst and hunger.

Dogs are there frequently compelled, in their capacity of scavengers, to eat garbage in a state of putrefaction, and

imbibe water the very opposite of pure, yet these regions do not suffer from this canine pest like those in which the dog is better cared for.

INFLUENCE OF SEX AND GENERATIVE FUNCTIONS.

The sex of the animals in which the disease had been supposed to appear spontaneously, has, according to the celebrated veterinarian and inspector of the French Veterinary Schools, M. Renault, and others of perhaps less authority, a powerful influence in the production of rabies, and it has been asserted that it is only spontaneous in the males. We are of opinion that the influence exercised by the sex of the animal is very doubtful. As regards the influence of the generative acts in producing or preventing the disease, the evidence is equally unsatisfactory. We want more facts before any definite conclusion can be arrived at.

At present we can only deem it probable that there may be some foundation for the supposition that intense sexual excitement may produce rabies, especially when the desire is not capable of being gratified. The relation of the periods of "rutting" must also be taken into consideration. The dog bitch is usually in rut in February and August, and if procreation does not take place, it is sometimes renewed three months later, in May and November. Of course in domesticity there are exceptions to this rule. The cat usually ruts in spring and autumn, but is also affected by domestic habits. The female fox commences to be in rut about January and February, and the she-wolf, when aged, towards the end of December and in January. Younger animals are so in February and the beginning of March.

If the production of rabies was at all connected with this condition of the generative system, then we might expect the malady would be only prevalent at the period when rutting is general, whereas we find it is observed at all

seasons ; indeed, if the causes enumerated were at all influential in producing the disease, we should not only have it much more frequently than it now is, but it would be common in countries where it is very rare and never witnessed.

INFLUENCE OF ANGER.

The same may be said with regard to the effect of bites inflicted by angry dogs during the rutting or any other season, or caused by any other creatures.

Nothing can be more erroneous or terrifying than the assertion that rabies may be induced by the bite of a healthy animal, and it must be strenuously denied that such a result is possible. No wound or bite from a healthy dog can produce the specific disease we term rabies.

INFLUENCE OF BREED.

Rabies may be said to attack all breeds of dogs indiscriminately, though sufficient attention has not been paid to the class of animal in which it most frequently appears. Some writers have averred that small English dogs, spaniels, poodles, terriers, pomeranians, and the black retriever, are more particularly predisposed to contract the malady spontaneously.

Eckel, Pillwax, and Hertwig are of opinion that dogs kept only for luxury are the most dangerous.

Eckel established the following percentage :

Mongrels of all kinds	$53\frac{1}{3}$ per cent.
Small English breed	$12\frac{1}{5}$ „
Fox-hounds	$6\frac{1}{3}$ „
Poodles	5 „
Pomeranians	$2\frac{2}{7}$ „
Danish dogs and pointers	$2\frac{6}{7}$ „
Pugs and turnspits	$2\frac{1}{7}$ „
Mastiffs	$1\frac{3}{7}$ per cent.
Hounds, Sheep-dogs	$6\frac{5}{7}$ „

Saint-Cyr's observations are not in agreement, as he found in fifty-four cases of rabies the following proportions :

Hounds ... ... 3 Spaniels 16	...	...	35 per cent.
Pomeranians ... 12 Mastiffs ... ... 6 Bull and house-dogs 4 Newfoundland dogs 3	...	...	46·20 „
Mongrels ... 4 Moutons ... 2 Terriers, greyhounds 2 King Charles, Pug 2	...	...	18·80 „

In this country we have no definite statistics to refer to, but on what we have, we may conclude that dogs at large and dogs in confinement seem alike susceptible to the malady.

Returns from chief constables and inspectors of police might be usefully applied, for clearing up the point, as to the particular breed liable to contract rabies, and also to trace the source of infection. We are indebted to Major Ormsby, Halifax, for one return : the form he has adopted is clear, simple, and convenient, and might usefully be copied by others interested in this important social question. The police have great facilities of obtaining much valuable information on rabies, it only requires the same intelligent direction to utilise the results.

MAD DOGS IN WEST MORLEY DIVISION OF WEST RIDING, YORKSHIRE, FROM 1871 TO 1877.

Dates.	Number.	Description of Dog.	If traceable to bite, by what description of Dog bitten.
January, 1871	1	Black Retriever	
February, „	1	Cur	
May, „	2	Cross-bred	
June, „	1	Retriever	
„ „	1	Terrier	
July, „	1	Retriever	
„ „	1	Black and white Springer	
„ „	1	Setter	
August, „	1	Terrier	
September, „	1	Bull-dog	
July, 1872	2	Curs	
August, „	1	Cross-bred	
November, „	2	Retrievers	
December, „	1	Retriever	
„ „	1	Cur	Retriever.
February, 1873	1	Retriever	
March, „	1	Retriever	
August, „	1	Terrier	
September, „	2	Fox-terriers	
October, „	1	Cur	Bull and Terrier.
November „	9	Cross-bred	Cross-bred.
December „	2	Retrievers	
„ „	2	Scotch Terrier	
„ „	2	Cur	Scotch Terrier.
February, 1874	1	Scotch Terrier	
March, „	1	Blue Terrier	
„ „	1	Cur	
April, „	1	Scotch Terrier	
May, „	2	Terrier	
„ „	1	Retriever	
„ „	1	Cur	
„ „	1	Pointer	
June, „	1	Cur	
„ „	2	Terrier	
„ „	1	Retriever	
	52		

Date.	Number.	Description of Dog.	If traceable to bite, by what description of Dog bitten.
	52		
July, 1874	1	Retriever	
August, „	1	Retriever	
September, „	1	Newfoundland	
October, „	1	Spaniel	
December, „	1	Scotch Terrier	
January, 1875	1	Pointer	
February, „	1	Cur	
April, „	4	Terriers	2 by Fox-terrier
May, „	1	Cur	
June, „	1	Bull and Snap	
July, „	2	Cross-bred	
„ „	3	Terriers	
„ „	1	Springer	
„ „	1	Cur	
„ „	1	Retriever	
August, „	1	Terrier	
September, „	1	Terrier	
March 1876	1	Springer	
August, „	2	Terriers	
September, „	1	Setter	
December, „	1	Terrier	
March, 1877	1	Retriever	
May, „	1	Retriever	
„ „	1	Fox-terrier	
August, „	1	Fox-terrier	
„ „	1	Cur	
Total	85		

INFLUENCE OF AGE.

From the tables we have furnished by Continental observers, we may conclude that, from the earliest up to the latest period of his life a dog is liable to rabies, but that from one to seven years it appears to be most susceptible to the malady.

SUMMARY.

We have not found a satisfactory solution of the problem; but spontaneous generation cannot be altogether

denied, though its genesis cannot be assigned to any specific cause.

It is a malady *sui generis*, and how it was primarily induced we know not. It certainly appears to be on the increase in the great centres of civilisation in Europe, and its development would seem to coincide, as has justly been remarked by Professor Röll, with the degree of domestication and over-refinement or "softness" of the dog.

CONTAGION.

Since the days of Aristotle and Celsus, the contagiousness of the disease has been recognised, and we coincide with those veterinary authorities who assert that in the immense majority of cases the malady is the result of inoculation by animals affected with the disease. Bouley was so convinced of this fact, that he believed that nine hundred and ninety-nine cases out of a thousand were due to contagion.

VITALITY OF THE VIRUS.

The *contagium*, or deleterious principle, is present at the commencement of the malady, and continues to be formed until the termination of life; but it has been determined that it does not preserve its potency long after that event. Observations and experiments have proved that the disease is not transmissible to man, mammifers, or birds by the usual *media* at a later period than twenty-four hours after the death of a rabid animal, or after cadaveric rigidity has completely invaded the dead body.

NATURE OF THE VIRUS.

We know nothing as to the intimate nature or composition of this animal poison, except that it is organic matter in a peculiar condition, capable of reproduction, when transferred to other creatures, and producing specific effects in them re-

sembling those developed in the animal from which it was originally derived. We can only judge as to its presence and virulency by the results it produces when introduced into the blood of previously healthy animals. This specific principle is what is technically designated a "fixed" virus in contradistinction to some other animal contagions, which are termed "volatile" from their capability of being transmitted through the medium of the air, breath, etc., surrounding the infected creatures.

We have numerous instances of presumed volatile infection on record, but nearly all observation, and certainly all experiment, go to prove it fixed.

THE SALIVA.

The vehicles in which the poisons are contained are various.

From the earliest times the saliva or mucus from the mouth has justly been considered as the medium *par excellence*, and there can be no doubt whatever as to its being the agent of transmission in nearly every case of communicated rabies.

But nothing has been discovered in the morbid saliva or foam from the mouth of the mad dog to account for its poisonous properties; it is the same clear, ropy fluid in the rabid as in the healthy animal, and the microscopist seeks in vain for its death-bringing power; neither can the chemist trace any alteration in the quantity or quality of its constituents, or distinguish the presence of any new or unusual element.

THE BLOOD.

There exists strong presumptive evidence that the blood in rabies, as in several other contagious diseases, is impregnated with the virus, though the experiments of Breschet, Magendie, and Dupuytren are opposed in their results to those of Heckel and La Fosse.

THE FLESH.

Can the flesh of creatures which have died of rabies, or been killed while affected with it, communicate the malady? The evidence is contradictory, both as regards cooked and uncooked flesh.

The number of authorities who have stated that accidents have arisen fron the consumption of flesh of rabid animals as food is not meagre, nor are they of slender repute. The question as to the innocuousness of the flesh would appear for these reasons to be based upon negative and affirmative facts; and though no rigid conclusion can be arrived at when it is so divided by contrary opinions, yet it must be remembered that the negative facts only demonstrate the inconsistency of the communication of the disease in this manner, while the affirmative facts, if properly observed by reliable authorities, should solve the problem.

MILK.

The influence of milk obtained from animals supposed to be suffering from rabies has received much attention, and the facts relating to its virulence are negative and positive, so that in the uncertainty in which the question remains, it would be well to proscribe the use of milk obtained from animals supposed to be actually rabid, for it must be always remembered that one positive fact is worth a thousand negative ones.

OTHER SOURCES OF THE VIRUS.

We have examined other questions, as, does the virus exist in the nerves? is the virus contained in the breath? does it exist in the preparation or other secretions or excretions? and find the results as follows:

Rossi affirms that rabies can be induced by transferring a portion of nerve from a diseased to a healthy animal, and

Hertwig, after carefully repeating this experiment, also produced the disease. As regards the breath and perspiration, there is no proof of a positive kind that the disease may be thus conveyed, whilst Röll asserts that the products of secretion and excretion are equally charged with the virus.

INCUBATION IN THE DOG.

The period of incubation in animals is very uncertain, and in many cases it cannot be ascertained with any degree of probability, as animals are frequently wounded by others without any particular notice being taken of the circumstance, and also, as frequently, without any one observing the injuries at the time of or after their infliction. Indeed, it is common to hear owners of rabid dogs assert that their dogs have never been from home, or if abroad, had never left them for a second; that they could not, therefore, be bitten without their knowledge, and they were not cognisant of such an occurrence.

The evidence of statistics and facts may be useful in fixing an approximate time. La Fosse states that the shortest authenticated period in his experience was seven days, and the longest 155 days.

Röll gives from three to six, and rarely from seven to ten weeks; whilst Blaine asserts that the majority of cases occur between the third and seventh week, though some are protracted to three, four, or even a greater number of months. A week was the shortest period he had noticed. Youatt has known instances in which the first symptoms has only become manifest after from five to seven months, and he never knew of a case occurring before 17 days intervening. Of nine cases which Peuch could rely upon, the symptoms appeared after the bite, in each, at an interval of 95, 88, 35, 26, 24, 22, 18, 15, and 10 days respectively.

In 1863 Renault reported that of sixty-eight dogs inocu-

lated experimentally, or bitten, the malady was developed in:

1	from	5th to 10th	day.	7	from	45th to 50th	day.
4	„	10th „ 15th	„	2	„	50th „ 55th	„
6	„	15th „ 20th	„	2	„	55th „ 60th	„
5	„	20th „ 25th	„	4	„	60th „ 65th	„
9	„	25th „ 30th	„	1	„	65th „ 70th	„
10	„	30th „ 35th	„	4	„	70th „ 75th	„
2	„	35th „ 40th	„	2	„	80th „ 90th	„
8	„	40th „ 50th	„	1	„	100th „ 118th	„

In Saint Cyr's cases of confirmed rabies, 1865, there were only twenty-six, the date of whose inoculation could be positively ascertained. In these the latent period was:

Cases.	Days.	Cases.	Days.	Cases.	Days.
1	16	2	32	2	50
1	18	1	33	2	60
3	21	1	35	1	62
2	24	1	36	1	86
1	30	1	38	2	90
1	31	1	41	2	105–115

Bouley has known instances in which the latent period was twelve days, and seven months, though they were rare. It was usually from six to twelve weeks. According to Haubner, in 200 cases, the appearance of the disease within two months was 83 per cent.; three months, 16 per cent.; four months, 1 per cent. He mentions an instance in which the incubatory period was from seven to eight months, and another in which it was fourteen months. He gives an average of three months. From these statistics and facts it may be seen that nothing can be said with certainty or in a positive manner, as to the length of the interval which elapses between the receipt of the injury and the appearance

of rabies; and that it is therefore hazardous to say, when a dog has been wounded by one that it is rabid, at what period it may be considered safe from an attack of the disease, as there are no reliable limits to this latent period.

RÉSUMÉ OF THE SYMPTOMS IN THE DOG.

As it is most important that the symptoms of rabies in the dog should be remembered, the following *résumé* of the most notable are given for the guidance of those who keep dogs, or who may have more or less to do with them. Medical men might usefully bear the details in memory, and educate the public in respect to them.

1st. The disease is not characterised by fits of fury at its commencement, but is, on the contrary, to all appearance a benignant malady, though even then the saliva or foam is virulent or poisonous. The dog is at this period very dangerous by its licking rather than biting, for as yet it has no tendency to use its teeth.

2. At the commencement of the disease the animal's temper becomes changed. It is dull, gloomy, and silent, seeks solitude, and withdraws into the most obscure corners. But it cannot rest long in one place; it is fidgety and agitated, goes here and there, lies down, and gets up, prowls about, smells, and scratches with its fore-paws. Its movements, attitudes, and gestures, at times, would indicate that it is haunted by, and sees phantoms; it snaps at the air, and barks as if attacked by real enemies.

3. Its appearance is altered, it has a gloomy and somewhat ferocious aspect.

4. In this condition, however, it is not aggressive so far as mankind is concerned, but is as docile and obedient to its master as before. It may even appear to be more affectionate towards those it knows, and this it manifests by a greater desire to lick their hands and faces.

5. This affection, which is always so marked and so enduring in the dog, dominates it so strongly in rabies that it will not injure those it loves, even in a paroxysm of madness; and even when its ferocious instincts are beginning to be manifested and to gain the supremacy over it, it will yet yield obedience to those to whom it has been accustomed.

6. The mad dog has not a dread of water, but, on the contrary, will greedily swallow it. As long as it can drink, it will satisfy its ever-ardent thirst; even when the spasms in the throat prevent it swallowing, it will nevertheless plunge its face deeply into the water and appear to gulp at it. The dog is therefore not hydrophobic, and hydrophobia is not a sign of madness in this animal.

7. It does not generally refuse food in the early part of the disease, but sometimes eats with more voracity than usual.

8. When the desire to bite, which is one of the essential characters of rabies at a certain stage, begins to manifest itself, the animal at first attacks inert bodies, gnawing wood, leather, its chain, carpets, straw, hair, coal, earth, the excrement of other animals, or even its own; and accumulates in its stomach the remains of all the substances it has been tearing with its teeth.

9. An abundance of saliva is not a constant symptom of rabies in the dog. Sometimes its mouth is humid, and sometimes it is dry. Before a fit of madness the secretion of saliva is normal; during this period it may be increased, but towards the end of the malady it is usually decreased.

10. The animal often expresses a sensation of inconvenience or pain during the spasm in its throat, by using its paws on the side of its mouth like a dog which has a bone lodged there.

11. In dumb madness the lower jaw is paralysed, and drops, leaving the mouth open and dry, and its lining mem-

brane exhibiting a reddish-brown hue; the tongue is frequently brown or blue coloured; one or both eyes squint, and the creature is ordinarily helpless, and not aggressive.

12. In some instances the rabid dog vomits a chocolate or blood-coloured fluid.

13. The voice is always changed in tone, and the animal howls or barks in quite a different fashion to what it did in health. The sound is husky and jerking. In "dumb" madness, however, this very important symptom is absent.

14. The sensibility of the rabid dog is greatly blunted: when it is struck, burned, or wounded, it emits no cry of pain or sign as when it suffers or is afraid, in health. It will even sometimes wound itself severely with its teeth, and without attempting to hurt any person it knows.

15. The mad dog is always very much enraged at the sight of an animal of its own species. Even when the malady might be considered as yet in a latent condition, as soon as it sees another dog it shows this strange antipathy, and appears desirous of attacking it. This is a most important indication.

16. It often flies from home when the ferocious instincts commence to gain an ascendency, and after one, two, or three days' wandering, during which it has tried to gratify its mad fancies on all the living creatures it encountered, it often returns to its master to die. At other times it escapes in the night, and after doing as much damage as its violence prompts it to, it will return again towards morning. The distances a mad dog will travel even in a short period are sometimes very great.

17. The furious period of rabies is characterised by an expression of ferocity in the animal's physiognomy, and by the desire to bite whenever an opportunity offers. It always prefers to attack another dog, though other animals are also victims.

5. This affection, which is always so marked and so enduring in the dog, dominates it so strongly in rabies that it will not injure those it loves, even in a paroxysm of madness; and even when its ferocious instincts are beginning to be manifested and to gain the supremacy over it, it will yet yield obedience to those to whom it has been accustomed.

6. The mad dog has not a dread of water, but, on the contrary, will greedily swallow it. As long as it can drink, it will satisfy its ever-ardent thirst; even when the spasms in the throat prevent it swallowing, it will nevertheless plunge its face deeply into the water and appear to gulp at it. The dog is therefore not hydrophobic, and hydrophobia is not a sign of madness in this animal.

7. It does not generally refuse food in the early part of the disease, but sometimes eats with more voracity than usual.

8. When the desire to bite, which is one of the essential characters of rabies at a certain stage, begins to manifest itself, the animal at first attacks inert bodies, gnawing wood, leather, its chain, carpets, straw, hair, coal, earth, the excrement of other animals, or even its own; and accumulates in its stomach the remains of all the substances it has been tearing with its teeth.

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17. The furious period of rabies is characterised by an expression of ferocity in the animal's physiognomy, and by the desire to bite whenever an opportunity offers. It always prefers to attack another dog, though other animals are also victims.

18. The paroxysms of fury are succeeded by periods of comparative calm, during which the appearance of the creature is liable to mislead the uninitiated as to the nature of the malady.

19. The mad dog usually attacks other creatures rather than man when at liberty. When exhausted by the paroxysms and contentions it has experienced, it runs in an unsteady manner, its tail pendant, and head inclined towards the ground, its eyes wandering and frequently squinting, and its mouth open, with the bluish-coloured tongue, soiled with dust, protruding. In this condition it has no longer the violent, aggressive tendencies of the previous stage, though it will yet bite every one, man or beast, that it can reach with its teeth, especially if irritated.

20. The mad dog that is not killed perishes from paralysis and asphyxia. To the last moment the terrible desire to bite is predominant, even when the poor creature is so prostrated as to appear to be transformed into an inert mass.

CHAPTER XII.

HISTORICAL AND BIBLIOGRAPHICAL.

In an address delivered at the Munich meeting of the German Association of Naturalists and Physicians, 1877, Virchow* said: "That medical men were the patriarchs of science, inasmuch as we have the dogmatic current at its longest, and medicine was the only science which has a continuous history of nearly 3000 years."

The evidence on rabies illustrates both the antiquity of medicine, and the antiquity of our knowledge as to its existence, for it is veritably lost in the mists of time. We have the assertion of Plutarch that it was known in the days of the Asclepiadæ, we have the mythological legend of the fate of Actæon,† and we have dimly floating traditions that it was known at a more remote period to the Egyptians.

We may divide, for bibliographical purposes, its history into different epochs, commencing with

THE EVIDENCE OF WRITERS BEFORE CHRIST.

Whether Homer was acquainted with the disease is a sub-

* "Die Freiheit der Wissenschaft in Moderner Staat," Berlin, 1877.

† "Inscius Actæon vidit sine vesto Dianam,
Præda fuit canibus nec minus ille suis."
OVID, *Tristia.*

ject upon which commentators disagree. Various dates are assigned to his poems, as from 962 to 915 B.C., whilst Wolf has fixed their collection and arrangement by Pisistratus at 550 B.C.

The Greek term for rabies we have mentioned—Lyssa. Homer,* in his "Iliad," compares Hector to a mad dog, a term applied by Teucer; whilst Ulysses, speaking of him to Achilles, says:†

"So with a furious *Lyssa* was he stung."

The word occurs in other places.

Moseley‡ does not believe that Homer referred to this disease, and observes that the epithets given to Hector, which have puzzled and misled conjecturers, mean nothing more than that his violence resembled insanity, and his fury rendered him like an enraged dog.

Hippocrates§ is supposed, by some, to refer to the disease from the following passage:

"Phrenitici parum bibunt, ex levibus strepitibus facile irritantur, tremuli sunt, aut convulsionibus tentantur." He does not mention it by name, so that it is a matter of inference from his general knowledge, and from the fact that it was known about his time, that he must have been acquainted with it. He is supposed to have been a contem-

* Homer, Iliad, viii. 299; ix. 239; xiii. 53, 542. In reference to Homer and the word Lyssa, see Liddel and Scott's admirable Lexicon, in which, under the word λυσσα, will be found a set of references, which bear on the question. The passage which they mention from Pliny tends strongly to confirm the view of Homer's acquaintance with canine madness.

† Mason Good, "Study of Medicine," vol. iv. p. 381.

‡ Moseley "On Hydrophobia, its Prevention and Cure." Page 4.

§ Hippocrates. Prædict. lib. i. 16.

porary with Socrates, and Xenophon*, another contemporary, has left us some lines in which the word "lyssa" has been introduced; it occurs in a speech addressed to his soldiers. Hippocrates'† birth is fixed, on the authority of Soranus, in the year 460 B.C.

Aristotle‡ (B. 384 B.C. D. 322 B.C.) has left a description, clearly proving that canine madness was known in his time, for he says: "Dogs are subject to three diseases—rabies, angina, and podagra; rabies causes madness in dogs, and all animals they bite have the rabies, excepting man."

The ancient Jewish oral, or unwritten law, is compiled in the Talmud, a work reputed to have been carried on from 536 B.C. to 220 B.C., and it is said that rabies was known at that period, as it is mentioned in the records we possess of these writings.

Democritus, who lived about 400 B.C., and some of whose works have come down to us, has also the credit of having recognised the disease; whether his writings are apocryphal or not, we are told§ that he attributed the seat of the disease to the nervous system.

Virgil (B.C. 70; D. 19 B.C.), though not a physician, according to Moseley, in his descriptions, comes nearer the mark than any physician who had written expressly on the subject.

He classes canine madness among the distempers of sheep and cattle, and as brought on by a pestilential state of the atmosphere.

In the 3rd book of the Georgics, line 496, he says:

"Hinc canibus blandis rabies venit."

* Holland and Shinkwin's Lectures, *Med. Press*, 1865. Xenophon, Anab. lib. v.

† The Works of Hippocrates. Syd. Soc., page 9.

‡ "Hist. Animal," lib. viii. c. 22.

§ Holland and Shinkwin's Lectures, *ut suprâ*.

As an instance of recovery, reported to have been cured by bathing, we may mention the case of Euripides, one of the Greek tragic poets, the received data of whose birth is fixed in the year 480 B.C., and whose death is assigned to the year 406 B.C. Many other references may be found in other writers, but we have selected only a few; they afford ample and satisfactory proof of the early period at which rabies was recognised both in man and animals.

THE EVIDENCE OF WRITERS FROM THE SECOND TO THE TENTH CENTURY.

As a connecting link between the two periods, we commence with Celsus, the so-called Roman Hippocrates, who flourished under the Augustan era, which began 27 B.C., and ended 14 A.D. The writings of Celsus have furnished inexhaustible materials for subsequent writers, and his works on medicine are familiar to nearly every modern student and physician. His evidence is very valuable, for he tells us the origin of the name which has come down to us through so many centuries.

"The Greeks," he says,* "call it ὑδροφοβία, a most wretched disease, in which the sick person is tormented at the same time with thirst and the fear of water, and in which there is but little hope." This sagacious and celebrated physician fully recognised both the disease and its dangers, and though many of his views are irrational, there is a substratum of truth in them. He was of opinion that the bites of all animals were dangerous from the presence of some venom: "Autem omnis morsus habet fere quoddam virus." In his precautions, he has forestalled many of the remedies of after ages, for he recommends suction, and refers as a proof of the innocency of the operation to the family of the Psylli, who

* Celsus, lib. v. c. 27.

with the Marii enjoyed the special privilege of extracting the poison by suction with the mouth. In sucking the wound it appears to have been recognised that it was most essential for the safety of the operator that no sores or abrasions should be on the lips or in his mouth.* In the following description we have an enumeration of his other remedial measures. He tells us, "If the wound be violent the cupping instrument is to be applied, and if very slight a plaster is to be immediately put on, and particularly that of Diogenes. . . . Afterwards, if the part is neither nervy nor muscular, the wound is to be cauterised; if it cannot be burnt, it is not unfit for blood-letting. Then those applications suitable for other wounds are to be put over the burnt wound; but if not burnt, then those medicines which violently corrode; after which the ulcer will be healed in the usual way."†

We have mentioned in another chapter his views on the efficacy of bathing.

From the Greek name of this disease there can be no doubt the Roman physicians derived most of their knowledge from their Greek brethren, and amongst the writers of the first century we must estimate Pedanius Dioscorides, the author of a celebrated work on Materia Medica.

Dioscorides‡ mentions that a man named Themison had the disease, and recovered. His treatment was somewhat similar to that of Celsus, but he advised extirpation by the knife, scarification of the parts above the wound, and the use of a drain to prevent the virus passing into the system. He also ordered cupping, and in desperate cases burning, believing fire before all other things to be the most efficacious in destroying the virus.

Gratius Faliscus, a poet and contemporary of Ovid, men-

* De Medicina, book v. c. 27.
† Celsus, lib. v. c. 21.
‡ Dioscorides, lib. ii. c. 12.

tions rabies as a disease of dogs in his work entitled the "Cynegeticon," and Ovid* (18 A.D.), has alluded to rabies and its fatality, along with gout, in the following lines:

"Tollere nodosum nescit medecina podagram nec formidatis auxiliatur aquis."

Pliny† (B.[1] A.D. 22; D. 79 A.D.), the indefatigable observer and collector of facts, no matter of what nature or importance, has left us some amusing descriptions of the various remedies for the disease in his voluminous work on natural history, and the curious will find in the thirty-seven books of his "Historia Mundi" many interesting references to the malady—a veritable *mélange* of accurate observation mingled with superstition and absurdities.

We may also mention the name of Columella,‡ who informs us of a superstition which has been practised even in our own day. He tells us it was believed amongst the shepherds that if on the fortieth day after the birth of a pup, the last bone of the tail is bitten off, the tail will not grow, and the dog will be secured from rabies.

Scribonius Largus,§ a Roman physician in the time of Claudius (41 A.D. to 54 A.D.), briefly notices the disease in man, and asserts that no person was ever cured of it.

Cælius Aurelianus has been considered one of the best of the ancient authorities on this disease; the period when he flourished is uncertain.

Some writers place him as early as the first century of the Christian era, whilst others assert that he was at least a century later.‖ He has evidently borrowed from older

* Ovidii, ep. ex ponto, lib. i.

† Plin., Nat. Hist. *passim*.

‡ Colum., de re rustica.

§ De comp Med. c. 45. Nemo adhuc correptum hoc malo, expeditus est.

‖ Smith's Classical Dictionary of Biography.

writers, as Eudemius, Soranus, and others. He has left us a very accurate description, to which we have previously alluded. He refers to the possibility of hydrophobia arising as a symptom in other diseases, for he says :

" Est præterea possibile, sine manifesta causa, hanc passionem corporibus inasci, cum talis fuerit strictio sponte generata qualis a veneno."*

Aurelianus adopts a more hopeful tone than many of our modern physicians, for he tells us that sometimes patients suffering from this disease are cured :

" Quomodo curandi sunt hydrophobi."

He has detailed the measures adopted by his predecessors, and in many respects they favourably compare with the practice of the year 1800.

Galen,† (b. 130, d. 200 A.D.), the author of so many medical treatises, has left us a number of antidotes collected from the recipes of the Greek physicians, from which it would appear that rabies was well known, and a prevalent disease amongst them. His antidotes are of the most varied nature, and are principally interesting as illustrating the practice of his time. We also thus learn the names of a number of the physicians of his time, as Æschrion, Zopyrus, Cratippus, Hiras, Belchionius, Zeno Laodicei, Menippus, and Menelaus.

Galen exercised a considerable influence on succeeding writers, for his opinions were received by the ancient physicians as sacred oracles, and it would have been deemed a crime not inferior to heresy or treason for his successors to have opposed such authority. Lipscomb, in alluding to the influence of Galen, remarks, that the respect and veneration

* De acutis morbis, lib. iii. c. 9.
† De remediis, lib. iii. c. 10.
‡ Synopsis, lib. viii. c. 18.

which were attached to the name and rank of Galen, shut the doors of improvement on many succeeding generations, who, accordingly, never ventured to examine, still less to contradict any of his opinions.

In the third century we have evidence of the existence of rabies furnished by Claudius Ælianus of Prænestе, Claudius Galenus of Pergamus, and Olympius Nemesianus, a Carthagenian poet; whilst in the fourth century, Oribasius, of Pergamus, physician to Julian the Apostate, has described it, and alludes to its being generally fatal:

"Ex is vero qui a cane rabioso morso fuissent, servatum esse neminem."

This opinion he derived from Apollonius of Pergamus, who also said that persons having this malady from other auses are sometimes cured.

Ætius probably lived in the fifth century, though historians are not agreed about the exact date.* He was a native of Amida, and studied at the famous school of Alexandria. He has often been confounded with Aëtius, so-called the atheist, who lived at the time of Julian the Apostate. His description of the disease in dogs is considered the most accurate of any of the ancient writers.

In the sixth century we have evidence of its existence in the writings of Theomnestus, who in his "Geoponica" has devoted some attention to it. Paulus Ægineta, who, according to Abulpharagius,† lived in the seventh century, has compiled a very good account, from the writings of previous authors. He distinguishes between the disease due to the bite of a dog and the simple curable nervous disease arising from other causes. He observes that the result of inoculation was always fatal:‡

* Smith's Biographical Dictionary.
† Hutchinson, "Biographia Medica," 1799.
‡ De re Medicinæ, lib. v. c. iii.

"Cæterum eorum qui, in hanc affectionem inciderunt nullum sanatum esse."

Our chain of historic evidence for this period is almost completed by the writings of Jahiah-Ebn Serapion, a native of Syria, who believed that the disease produced by the bite of a mad dog was incurable, and who proposed that the patient should be made to swallow water by inclosing it in a globule of concrete honey.*

It is also mentioned by Rhazes (died A.D. 932),† an Arabian physician, who says that a certain man barked by night like a dog, and died; and there was one who, when he beheld water, was seized with trembling, horripilatio, and rigor; but when the water was removed from him these symptoms ceased.

We have some old Anglo-Saxon manuscripts, supposed to belong to the tenth century, which contain remedies and incantations wherewith to cure or exorcise the disease. In one of these, a Saxon Herbarium, are a number of curious recipes.

In the year 825 A.D., several people are said to have been cured by resorting to the shrine of St. Hubert, in the Ardennes, a practice in vogue even in the present age.‡

FROM THE TENTH TO THE NINETEENTH CENTURY.

Avicenna§ (b. 980.; d. 1036), the Arabian physician, marks a further step, both in the history of the disease and in the advance of our knowledge thereupon: his treatise being marked by accuracy of observation and completeness. The ashy tint of skin, oftentimes designated by the term rabic‖ roscola, noticed by many observers, as Codrondius, was first observed by Avicenna in the dog.

* Fleming, "Rabies and Hydrophobia."
† Rhazes, lib. xx. c. ii.
‡ "Life of St. Lambert," eleventh century.
§ Avicenna, canon, lib. iv. cap. v.
‖ Codrondius, "De Rabie, hydrophobia communiter dicta," 1610.

In the laws of Howell the Good, of Wales, which were revised about the year 1026, we are informed of the earliest mention of the disease in our own country.*

In the twelfth century Demetrius Pepagomenos, a Greek writer, who lived at Constantinople, is supposed to have referred to it in his work entitled the "Kynosophion," whilst in the thirteenth century it is alluded to by Albertus Magnus, Bishop of Ratisbon, and a century later by Laurentius Rusius.

Between the years 1500 and 1600, the literature began to expand, and we have the names of Montisianus, Paré, Mercuriali, Frascastor, and Baccius, as contributors.

In 1613 Spackmann published a work entitled "A declaration of such grievous accidents that commonly follow the bites of mad dogges;" this we may consider the first English work on the subject; during the next century the literature expanded into almost alarming proportions, especially on the Continent.

English writers shared in the general desire to clear up the nature of the malady, and we have many interesting and valuable works as the result of their exertions.

We may mention the names of Nugent (1753), James (1760), Bruce (1765), Layard (1762), Heysham (1777), Fothergill (1778), Vaughan (1779), Berkenhout (1783), McIlwaine (1787), Foot (1788), Hamilton (1798), and Bush (1797). At the beginning of the nineteenth century a stimulus was given to the subject, by the prevalence of the disease, and we have consequently a number of treatises, as those of Lipscomb (1807), Moseley (1809), Powel (1809), Gillman (1812), Parry (1814), Marshall (1815), Reid (1817), Blain (1817), and Youatt (1836). After this period in England we find a wide gap until we come to the year 1871, when Fleming published "Animal Plagues, their History and

* Fleming, *loc. cit.*, p. 20.

Prevention," followed in the year 1872 by his work, now classic, "Rabies and Hydrophobia." No doubt, in England the rapid extension of medical periodicals tended very much to diminish the number of special treatises, whilst the various handbooks on general medicine and surgery also explain the paucity of nonographs, as they all contain special articles on the nature of the disease. During the present century, Continental writers have produced works with inexhaustible rapidity. In our "Bibliographical Record" will be found the names of the principal works published.

About the beginning of this century, Bosquillon (1802) suggested that the virus of rabies was only a chimera, and that fear alone was the great factor in its production; in this view he was supported by Girard, and we believe there are some at the present day who are still of this opinion. French veterinarians have paid particular attention to the disease, and we may mention, in particular, the name of M. Bouley, as one of the most accurate and reliable authorities of the present age; he has enriched the literature of rabies by many valuable contributions. The interest excited by this malady is well illustrated by the extent of the literature, and though it is a matter of regret that the production of so many works has produced so little proportionate benefit, still they are evidences of the desire and ambition of our profession to place rabies on a more satisfactory footing. Future writers have an inexhaustible mine to work at amongst the old writers, and in order to facilitate reference, we have arranged a bibliographical record, which we have endeavoured to render as complete as possible.

CHAPTER XIII.

THE GEOGRAPHICAL DISTRIBUTION OF RABIES.

We have evidence that the disease has prevailed amongst animals, as the dog, cat, wolf, hyena, fox, etc., over a wide extent of the world, and it has been asserted that no land or climate is free from rabies. European countries, as Germany, France, Italy, Austria, Holland, and England, appear to have suffered from it most extensively. It was at one time believed it was confined to climates of moderate temperature, and that warm countries, as the East, Egypt, Turkey, and South America, were free from its ravages. More extended observations have proved the fallacy of this belief. Extreme cold regions were also considered protected, but the erroneous conclusions of earlier observers have been upset by other more competent and later travellers. The disease has been observed in various animals under the most opposite temperatures in the following countries and localities:

Abyssinia (North),* Africa,† America (North and South),‡ Arabia,§ Asia,‖ Affghanistan,¶ Algeria** Arctic

* Rochette d'Hericourt and Bouchardat, "Annuaire de Ther.," 1850.

† Sir Samuel Baker, "The Nile Tributaries of Abyssinia."

‡ Fleming, "Animal Plagues," p. 528.

§ Burton, "Pilgrimage to El Meccah," vol. i.

‖ Pruner, "Die Krankheiten des Orientes," p. 431.

¶ Elphinstone, "Account of the Kingdom of Capaul."

** Colin, "Recueil des Mem. de Med. Mil."

Regions,[2] Brazil,[3] Ceylon,[4] China,[5] Cochin China,[6] Denmark,[7] San Domingo,[8] Damascus,[9] Egypt,[10] Gibraltar,[11] Guadaloupe,[12] Holy Land,[13] Havanna,[14] Hispaniola,[15] Hayti,[16] India,[17] Jamaica,[18] Indies (West),[19] Mexico,[20] Mauritius,[21] Malta,[22] Norway,[23] Peru,[24] Russia,[25] Roumania,[26] Syria,[27] Sweden,[28] Turkey,[29] Constantinople,[29] Symrna.[29]

Probably, it has been introduced into many countries by communication with Europeans. A few countries have yet escaped, as Australia, New Zealand, the Azores, and St. Helena: at least, we have no conclusive evidence up to the present that rabies has been noted or recorded there.

[2] "Arctic Explorations," vol. i., and "Voyage of H.M.S. *Resolute* to the Arctic Regions."
[3] Sigaud, "Travels in the Brazils," p. 424.
[4] Tennent, "Ceylon."
[5] Fleming, "Rabies and Hydrophobia," pp. 50–54.
[6] *Ibid.*
[7] Viborg, "De enzoötia canina atque hydrophobia," 1817.
[8] "De Moyens de conserver la Santé des Blancs et des Negres," 1786.
[9] Dr. Guillar, "Report," 1856.
[10] Dr. Pruner and De Bugiéres Bey.
[11] Fleming, p. 80. [12] *Ibid.*, p. 71. [13] *Ibid.*, p. 73, *loc. cit.*
[14] De Croix, 1863. "Animal Plagues, Fleming.
[15] Fleming, "Rabies and Hydrophobia," pp. 32, 71.
[16] *Ibid.*, p. 71.
[17] Choisel, Pamphlet, 1756. Moseley, "Canine Madness," 1809.
[18] Hilary, "On the Diseases of Barbadoes."
[19] Pernaud, "Journal de Med. Vet.," vol. iv. p. 535.
[20] Unienville, "Statist. de l'Ile Maurice," vol. ii. p. 332.
[21] Spencer Wells, *Lond. Med. Gazette*, 1847.
[22] Fleming, "Animal Plagues."
[23] "Peru as it is," Smith, vol. ii. p. 248.
[24] Gerson und Julius, Magazine, vol. viii. p. 273. Marochetti, "Obs. sur l'Hydrophobie," St. Petersburg, 1821.
[25] "Constantinesen, De la rage," Paris, 1869.
[26] Dr. Nicara and Dr. Sequet.
[27] "Suenska läk Sellsk. Arb.," 1824. "Ten Years in Sweden," p. 169.
[28] Dr. Camescasse, Ahmed Effendi, Dr. Michel, Fleming, p. 74, *loc. cit.*
[29] "Fleming, *loc. cit.*, pp. 30, 74.

The human subject is liable to the disease, and exposed to the danger of infection in every country where it exists in animals. We may state, on our evidence, that cold climates do not seem to suffer so much from its ravages.

A very significant return has been obtained from the Registrar-General for Scotland, the slight mortality in that country contrasting with the high death-rate in England, and from this we may draw an inference that the northern parts of our island are not so exposed to this plague. The nominal death-rate of England might probably be lowered if the Registrar-General adopted the step taken by his *confrère* in Scotland, viz., by expunging from the assigned nomenclature reputed cases of hydrophobia, and classifying them under their more correct appellation.

We have mentioned the influence of seasons and meteorological conditions, to which we cannot attach any perturbating influence in the production of the malady.

In concluding our report we must draw the attention of the profession to one important subject. Rabies illustrates the close connection existing between human and veterinary medicine. Our knowledge of rabies would have been limited but for the researches of such veterinarians as Blaine, Youatt, Bouley, Pillwax, Bollinger, and Fleming; and society and humanity in general owe a debt of gratitude to the sister profession for the labours which have furnished our profession with the groundwork upon which all our knowledge is based.

Human pathology cannot be divorced from its twin sister, comparative pathology, and we thoroughly agree with the aspiration of Fleming, that it is to be sincerely hoped both branches of medical science may ultimately be looked upon as one, and that the benefits to humanity to be derived from their union may be fully realised.

Veterinary medicine has of late years occupied a larger

share, both of the attention of the public and of the Government. Much may yet be done to advance our knowledge of the actual existence and extent of rabies in Great Britain, amongst all classes of animals. The veterinary schools might usefully assist by the publication of annual statistics on the prevalence of the disease, whilst Government might valuably aid by sanctioning the annual compilation of returns from the various districts under police supervision. We have said that the problem alone can be solved by a large accumulation of facts, and we have contributed our quota for this purpose. We have endeavoured to lay before the profession our existing knowledge on rabies so that our report might form a *point d'appui* for future workers, and we feel gratified that we have been the cause of stimulating further scientific inquiry into the nature of this affection. Science has alone for her object, Truth—and we feel, in the interests of science, a pleasure in leaving further investigation in the hands of such competent experimenters as Drs. Burdon, Sanderson and Lauder Brunton, to the publication of whose researches we look forward with interest and hope.

CHAPTER XIV.

CHRONOLOGICAL TABLE OF OUTBREAKS OF RABIES.

	YEAR
Outbreak in Franconia of rabid wolves	1271
„ „ Spain of rabies canina	1500
„ „ Flanders, Turkey, Hungary, Austria ...	1586
Epizoötic amongst wolves at Montbeliard	1590
„ rabies canina in Paris	1604
„ „ „ Suabia	1708
„ „ „ Hungary	1712
„ „ „ France, Silisia	1719–21
„ „ „ Hungary	1722
„ „ amongst wolves in Silisia	1725
„ „ „ dogs in England	1734
„ „ „ „ „	1735
„ „ „ „ Barbadoes ...	1741
„ „ „ „ Scotland	1748
„ „ „ „ Charlestown, South America ...	1750
„ „ „ „ London	1752
„ „ „ „ London	1759–60
„ „ „ „ London	1762
„ „ „ „ France, Italy, and Spain	1763
„ „ „ „ Boston and North America ...	1768
„ „ „ „ Boston	1770–71
„ „ „ „ Lancashire ...	1774
In the French W. Indies, visited first time	1776–78
A number of people and animals bitten by a mad wolf	1779
The malady for the first time in Hispaniola and Jamaica	1783
Canine madness all over the United States of America	1785

	YEAR
Canine madness in England	1788
Epizoötic at Munster in Westphalia	1789
„ in Rhode Island, North America	1797
Appeared for the first time in Peru: vulpine rabies epizoötic at the foot of Jura Alps	1803
Appeared for the first time in Wurtemberg	1804
At Ulema, in Italy, a mad dog bit thirteen persons, of whom nine died	1804
Imported into La Plata by English sporting dogs ...	1806
Epizoötic at Dover	1807
„ in Ohio and North America	1810
For the first time in the Mauritius	1813
Canine madness frequent in Austria	1815
Epizoötic at Copenhagen	1815
A rabid wolf wounded several people in France ...	1817
Twenty-six persons under the care of Marochetti, in Podolia, in consequence of bites	1818
Vulpine rabies in the Upper Danube and Bavaria. This year the Duke of Richmond, then Governor-General of Canada, was bitten by a captive fox, and afterwards perished of rabies	1819
Vulpine rabies common in Thuringia	1821–22
Canine rabies in Holland	1822
„ common among foxes in Hesse, and epizoötic in Sweden	1824
Rabies prevalent amongst foxes in Germany. Two children, a horse, and an ox were bitten by a mad badger in Bavaria	1825–26
Prevalent in England, twenty-eight deaths in England and Wales	1828
Prevalent in Dresden	1829
„ „ Saxony, England, Vienna	1830
„ „ Posen	1831–32
Prevailed to an alarming extent in Barbadoes ...	1833
General in Saxony	1834
„ Pomerania	1835
„ Brandenburg, Saxony, Paris	1836
Prevalent amongst foxes in Germany	1837
„ „ „ Austria	1838
Epizoötic in Vienna	1839
„ „ Lyons	1840
„ „ Scotland, Vienna	1841
„ „ Aix, Mesmes, Rouen	1842
Epizoötic in Wurtemberg, Lyons	1842
„ amongst cattle, believed to be spontaneous rabies by Dr. Adolphi	1844

	YEAR
Great numbers of mad dogs were seen in Roscommon, Ireland: supposed to have appeared at Malta for the first time	1847
Epizoötic of canine rabies in Northern Germany; at Hamburg alone no fewer than 200 cases were observed amongst dogs. A mad wolf, in France, during a single day, bit forty-six persons and eighty-two head of cattle	1851
Rabies showed itself amongst dogs and a herd of deer to a serious extent in England. A dog in Berkshire bit twenty sheep	1856
An English bloodhound suddenly became mad, and bit several people, one man died of hydrophobia at Hong Kong	1857
Rabies prevalent in Northern Germany, France, Spain, and America	1860
Cases of hydrophobia amongst Native Chinese at Tientsing, near Pekin, North China	1861
Sir Samuel Baker informs us of an epizoötic in part of Africa	1862
Great apprehensions entertained in Lancashire as to a severe outbreak of the disease, and to such an extreme degree had the alarm attained, that upwards of 1000 dogs were destroyed in Liverpool alone ...	1864
The malady largely on the increase in London and France	1865
The disease assumed a formidable extension and virulency in England, especially in Lancashire. Thirty-six deaths registered from hydrophobia ...	1866
Rabies showed itself amongst the English dogs at Shanghai during the summer	1867
Many cases of rabies reported in Belgium	1868
Rabies noted in Paris. Early in this year cases of rabies began to be observed in Lancashire, from which it has spread as far as Scotland	1869
Prevalent in the North and West Riding	1870
The disease observed in Cheshire, Derbyshire and Nottinghamshire. Outbreak amongst the Quorn and Albrighton hounds	1871
Outbreak amongst the Durham fox-hounds. Human death-rate, 56	
Prevalence of the disease in various parts of England. Death-rate, 39	1872
Diminution of number of cases. Death-rate, 28 ...	1873
Rapid rise in the number of reported cases, sixty-one deaths registered. In Scotland from 1855 to 1874, only three cases of hydrophobia registered... ...	1874

	YEAR
A slight decrease in number of deaths—forty-seven...	1875
Rabies prevalent in various parts of England ...	1876
Three cases reported at Glasgow, in *Lancet*, 1877. Considerable excitement through the country owing to the spread of the disease, in consequence of which, in October, 1877, the *Medical Press and Circular* Commission published its special report...	1877
Several mad dogs reported in various parts of England; one appeared at Todmorden, in March, and was killed after biting eight other dogs. A child was slightly injured by it, without any ill effects up to the present. Our assertion that rabies is a *curable* and *controllable* disease further confirmed, and thus one of the objects of our report has been achieved. Thomas Hicks, who was bitten by a dog eight weeks previously, treated for rabies in the Chelmsford Infirmary. Discharged cured, after three weeks' treatment ...	1878

CHAPTER XV.

BIBLIOGRAPHY OF PRINCIPAL MONOGRAPHS AND ESSAYS. CHRONOLOGICALLY ARRANGED.

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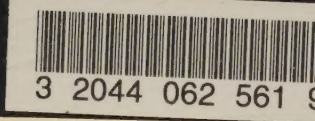
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